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Annealing Trolley Wires

The practice of connecting together different sections of trolley wire in a large city system has both advocates and opponents. There are a few who will maintain that it is in every way a desirable practice to bridge across the various section insulators with jumpers of one kind and another, but many companies have been driven to it by either a temporary or chronic lack of sufficient feeder copper. Theoretically, the ideal method is to keep each section of trolley wire entirely insulated from every other section and with a circuit breaker at the power station for each section, so that the breaking and grounding of the trolley wire in one section will in no way interfere with the operation of the balance of the system. It will frequently happen, however, that cars will get bunched on one section so as to cause an excessive drop of potential while adjoining sections may be very lightly loaded. In order to enable the feeders on one section to be assisted by those on adjoining sections, it has become a very common practice to put jumpers around the section insulators so as to connect together the different sections through the medium of fuses or automatic circuit breakers. Thus current can be fed into a section from adjoining sections as well as from its own feeder in case it has an exceptionally heavy load, while at the same time, if there is an actual dead ground, the circuit breakers will open so as to isolate the grounded section. The main objection to this practice is that it requires a much heavier current on the trolley line to open all the circuit breakers than it would to open simply the feeder circuit breakers supplying it, because the trolley wire section has three sources of supply, viz., its own feeder circuit breaker and the circuit breaker at each end connecting it with the adjoining section.

On a large city system in practice, this objection may mean that sufficient current can flow through the trolley wire to anneal long lengths of it before the circuit breakers open. Its life after such an annealing process is, of course, no better than would be that of a soft drawn wire. In fact, it is almost ruined for trolley service. The current required on the modern city railway system in the downtown districts when large numbers of cars of about 40 tons weight are operated, is such as to make it necessary to set all circuit breakers for very heavy current, and it sometimes does not take a great deal more than the regular current to anneal the wire. Thus, a trolley wire may be carrying a heavy current to supply the regular load imposed by the cars, and in addition a ground may come on the line at some adjoining section, which may not be enough to open the circuit breaker between the sections, but still be sufficient to anneal some of the trolley wire.

One practice which gives some of the advantages of utilizing all the feeder copper at points of greatest load, while at the same time lessening the danger of ruining considerable lengths of trolley wire, is that of placing equalizers between the feed wires at various points and inserting automatic circuit breakers or fuses in these equalizers. The trolley wire is then not called upon to carry current to any other section than its own. Of course, if the trolley line is not paralleled with a sufficiently heavy feeder where the traffic is very heavy near a power station, and the trolley wire is thus compelled to carry the total current for some distance, it will cause such an excessive drop in the wire as to anneal it in ordinary service, but such conditions are not often found.

Another cause of annealed trolley wire is the use of soldered ears for supporting the wire. The wear is always greatest at the points of support in any event, and the annealing of the wire by a soldering torch at this point causes a considerable shortening of the life of the wire. It is this that has caused mechanical clamps and clips to be so popular with line superintendents, and incidentally has helped the introduction of figure 8 and grooved sections of trolley wire, which are well adapted to mechanical clamps.

A Record of the Zossen Tests

More than usual interest attaches to the record of the Berlin-Zossen tests of 1903, which has just become available through an English translation, for which Dr. Louis Bell has prepared an introduction discussing the general subject of train resistance. It is difficult to-day to estimate at its proper value the pioneering work of which this volume is the record. We are so used to looking at things through the glasses of current habits that we unconsciously distort all things which are unfamiliar in outline. A new conception or invention is or is not greeted with enthusiasm according to its relation to the preconceived category of useful things. If it clearly belongs in the conventional list of things approved it meets an enthusiastic reception. Otherwise it is stigmatized as "theoretical" until long after it has been proved successful, and then is damned as "uncommercial" by every interest that would be put to trouble by its competition. We need not go outside the line of railway history to grasp the truth of this view. The volume itself gives a striking bit of inner history in telling the story of the Berlin-Zossen Railway, and of the bitter opposition it had to meet from every source—beginning with a doubtful King and ending with the abuse of exasperated stage owners. No doubt there were fervent appeals to government to protect "vested interests" by preventing this wanton destruction of their earning capacity, appeals which have a strangely familiar note even to us of the twentieth century, used to the march of improvements. The Zossen tests strike deep at the commonplace commercial methods of transportation to which the world is just now accustomed. They were made for the very purpose of proving that the world's present methods, however useful, generally are behind the age in the matter of speed.

It is a somewhat singular thing that the speed records on railways are by no means always of recent making. Some of them run back nearly half a century, and many of them more than a decade, in spite of all recent improvements. Even now the number of trains in the world that actually are scheduled above 45 m.p.h. is very small indeed, and the trains on long runs at anywhere near that speed are even rarer. On all but the most important lines there is the same old succession of "peanut trains" as twenty-five years ago, in spite of the very great improvement in general accommodations. The fact is that the subsidiary things of travel have been wonderfully developed, while the main thing—getting there—stays in the same old place. The great service of the Zossen tests is in showing beyond the shadow of a doubt that existing speeds can be comfortably doubled without requiring the fulfillment of any impracticable or uncommercial conditions. The sources of previous doubt were threefold. In the first place there was a current opinion that no practicable roadbed could safely stand the speeds of 100 m.p.h. to 125 m.p.h. which were to be attempted. Even granting that they could be built, it would be possible only at prohibitive expense. Second, there were many who actually believed that the air resistance at these speeds would be so enormous that even if they could be reached at all, which was dubious, it would be at a cost in power absolutely out of the question in practical railroading. And finally, it was predicted that it would not be practicable to supply energy to the fast-moving car, even if the amount required were within the range of possible usefulness. In other words, very many persons with pretensions of experience in engineering took very little stock in the practicability of any speeds far beyond what their own familiar methods and apparatus could compass.

To each of the questions thus raised the experiments recounted in this book have given a definite and satisfactory answer. It proved, as some of those best qualified to judge had suspected, that the most substantial difficulty to be overcome was the instability of the ordinary roadbed, designed in accordance with experience at low speeds. In fact, the first series of Zossen tests was cut short by failure of the roadbed at speeds still below 100 m.p.h. But in the later tests here recorded it was shown that without going to unwarrantable expense and without any radical departure, the track and roadbed could be made entirely adequate for the speeds attempted. Grades and curves must, of course, be made relatively easy, the line must be well ballasted and the rails heavy and well laid, but that was all, provided the cars were properly designed. The most important new fact brought to light was the value of intelligent truck design and the need of proper balance in the moving parts. Given this, the motion at the highest speeds reached was steady and smooth, without it there was trouble at once. A common sleeper ran at speeds little above 100 m.p.h., with vibration altogether too severe. But balancing, just as in the case of a fast torpedo boat, removed the difficulty in a very satisfactory manner. As to the actual power required it proved to be nothing at all forbidding either from the technical or the commercial point of view. This matter is fully taken up in the introduction to the work. As there indicated, the mistaken notions on this point came mainly from reckless extrapolation far beyond the safe range of the older data. And, singularly enough, little weight seems to have been attached to the fact that nearly all the experimental runs with locomotives at high speed had clearly indicated much lower values of the total resistance than were customarily taken in the working formulæ hitherto used. In this, as in many other things, the Zossen runs here recorded show that high speed is easier than had been supposed.

The questions of power supply were likewise given definite and favorably answers. Given a supply of current at a voltage high enough to keep the total current per contact within reasonable bounds, ample energy could be delivered to the moving car. Even with the three flying contacts made necessary by the polyphase supply, no trouble of any moment was experienced. If later it should prove practicable to utilize single-phase current upon the car, the task of power supply would be rendered still easier. In any case, it is not in the least forbidding. The engineering difficulties of the task being thus disposed of, by no means the least interesting part of the book will be found to be the discussion of the commercial side of the problem. Here it has turned out, as in other similar studies of transportation, that the limit to profitable first cost is the density of traffic. No one would think of building a four-track railroad through a country devoid of large towns and of large cities as termini. Just so, no one would think of building a road for very high speed where the traffic was light. But given a line between large cities with heavy traffic on the express trains and one finds a state of things where high speed will pay. The various projects for a Berlin-Hamburg fast line presented in this volume make it very evident that a paying traffic is in sight there, and there is little reason to doubt that similar lines could be laid out in this country. With this fact once made clear, there is good hope that some fast line will be built ere long. The speeds now in vogue are those adapted better to hastily built roads in a partially developed country than to trunk lines in the heart of a great nation. The Zossen trials have cleared the way for action in a way that is comprehensive and final. From this time forth one cannot pass over high-speed projects as chimerical and impracticable. They must be discussed fairly and upon their merits. A few years of fast automobile work will make a mile a minute seem tame in the eyes of the public, and then the railroads will rise to the occasion. Meanwhile the world should be grateful for the admirable pioneering done by the Studiengesellschaft, as recorded in the volume which we are glad to be able to give to the American public. May it soon usher in the new era!

Car Design

The adoption of electric power for rapid transit lines has been followed by a curious interchange in car design between Europe and America during the last four or five years. For a long time the cross-seat center-aisle car was recognized as the standard American steam coach, just as the compartment car was considered the standard of the British steam lines. But on both sides of the water the previous seating arrangement was not found desirable, so that, while the British tube lines have introduced and are operating end entrance cars, the latest American practice is decidedly toward the use of the side door car. The coming adoption of electricity on steam lines for suburban service emphasizes the importance of a study of the relative advantages of different arrangements of seats, and for this reason the article by Mr. Fox, on another page, will be of interest. In this article the seating arrangements of some twenty-four different types of cars are discussed, and the writer suggests as a compromise a multi-side entrance car with seats for eighty passengers and a capacity for loading and carrying away 5760 passengers an hour from a terminal. The number of seats provided in this car is exceeded only by the British Great Eastern and French Ouest cars, both of which are impractical under American conditions, and by one of the types on the Liverpool Elevated Railway, which has three doors on each side.

The proposed car is made up by combining a number of features from other cars, principally from the Illinois Central, Berlin and Liverpool elevated types, and has a great many points to recommend it. At the same time, we believe that for the average conditions of city rapid transit service Mr. Fox lays too much stress on providing a large number of seats. With the growing congestion on surface lines, there is an increasing tendency to use the elevated and subway lines for short distance riding, and in this service many passengers would prefer to stand rather than take the trouble to secure a seat if it is much further from the door than the place available for standing. Again, we can foresee serious objections to the multi-side door in any service where it is impossible to carry away from the platform all of the passengers who may wish to travel by that train. This would be particularly true in the case of a transfer station like the island express stations in the New York Subway, where there is a constant stream of passengers across the platform from one train to the other, and where it would be very difficult for an end guard to close simultaneously a number of side doors unless assisted by a large number of station guards.

Rapid transit service can be roughly divided into four classes, each of which theoretically calls for a different type of car to best fulfil all the requirements. The first division would be that of purely suburban service, where the average haul is from 10 miles to 15 miles, and where there is plenty of time at the terminals to load and unload, but where the intervening stops should be brief. As there is no standing load, the ordinary steam passenger coach would fill these conditions fairly well if its entrance and exit facilities were better. For such a service the cross-seat center-aisle car with extra large end entrances, or with possibly one side entrance, would seem desirable.

Where the average ride is shorter, and where the passengers travel from a few important stations to and from other minor stations along the route, as in most elevated railway lines, and on some suburban and subway routes, larger entrances are of greater importance and standing room is more necessary. For such a service we believe that it is very desirable to provide considerable open space near the entrances, whether the latter are at the ends of the car, as in the New York Subway and Chicago West Side cars, or if side doors are used, as on the Paris Metropolitan and London Metropolitan District Railway. This space is useful as a reservoir or receiver for the boarding passengers while the doors are being closed and while the passengers are hunting for seats. It will also serve as a reservoir, where those who wish to leave the car at the next station can collect. It might be argued that this space will be blocked by standing passengers, but if this is the case it proves that many would prefer to stand here rather than go further back for a seat, and the remedy is to remove more seats and give a larger standing area.

Still a third class of service is that of a very short haul with only a few stations, like a bridge service, where, of course, the principal desiderata are plenty of standing room and plenty of doors.

The service on a road with a number of transfer stations introduces still other considerations, as already described. Here many side doors, while desirable for quick loading and unloading, will prove very difficult to close simultaneously against a stream of people, unless many station guards are employed. With tube or subway cars the introduction of side doors may also be prevented by lack of head room.

There is also no doubt that every opening to a car which is used by passengers to board and leave it is a source, if not of accidents, at least of claims, and hence is to be avoided. A multiplication of doors means a multiplication of claims, and while we believe in the use of side doors where their operation can be closely watched and remain under the immediate control of a station or platform guard, yet an effort should be made to limit them, except in possibly the third class of road mentioned above.

Too much stress should also not be placed upon lengths of station stops for different types of cars in different cities. Figures of this kind are interesting for reference, and some statistics of this kind are presented in this issue. But while these records have considerable value when made with varying types of cars in the same city, the difference in habits and quickness of movement between residents of different cities vitiates any general conclusions on the length of station stops as related to car design, unless the effect of these human qualities is given full consideration. There can be no doubt, however, that the tendency on both sides of the Atlantic is toward the abandonment of the old style platform and the introduction of two or more side doors, usually operated pneumatically from the end of the car. The Boston Elevated was the first in this country to use this type for purely electric rapid transit service, and the results in that city have proved satisfactory. The subject is one of the keenest present interest, and Mr. Fox's discussion in this issue will be followed by other articles treating on the same general subject.

CAR DESIGNS AND CARRYING CAPACITY

BY JOHN P. FOX

The great variety of car designs in Europe suggests, sometimes, that we may have carried standardizing too far in this country and failed to evolve types that might carry more, earn and save more than at present. When an American standard car seats forty-four passengers and a European manager can get for the same length of car 168 seats, with standing room easily for 150 more, it certainly sets one to thinking seriously; as again when a single city surface track and terminal can only allow about 9150 seats an hour with American cars and methods, and foreign methods can provide for the loading and carrying away of at least 40,000 seated passengers an hour through the same city street. The writer has been making for several years a careful comparative study of American and European car designs for surface, elevated and underground service, and hopes that the results will be of some service. The present article will take up the relative carrying capacity of different types of cars for elevated, underground or suburban traffic, where high station platforms are used.

In order to compare European and American rapid transit and foreign practice for the severest city service. The sliding side doors shown are usually operated by guards from the car ends, except with such foreign examples as Berlin, Paris and Liverpool, where passengers operate the doors themselves.

In the endeavor to shorten station stops, a curious interchange of car designs has taken place between this country and Europe. While the English in their electric trains have abandoned their many side doors for American end doors, believing the latter to allow shorter stops, the Illinois Central Railroad finds the Manhattan type of car greatly inferior to one with the seats facing each other and side doors to every group of seats. The difficulty with English steam cars for rapid transit is, of course, slowness of loading, because passengers naturally hunt for seats. They are quick enough in unloading, as shown by the rapidity found by an American engineer recently, who timed 500 passengers unloading from a Caledonian train in ten seconds from the time the train stopped. The loading difficulty has been eliminated in the Illinois Central car by the introduction of aisles. This enables passengers to enter by the nearest door and find seats later when the train is in motion. Again, all difficulties from swinging side doors are solved by making them sliding. But the English cars still furnish more than twice as many seats as the Illinois Central type

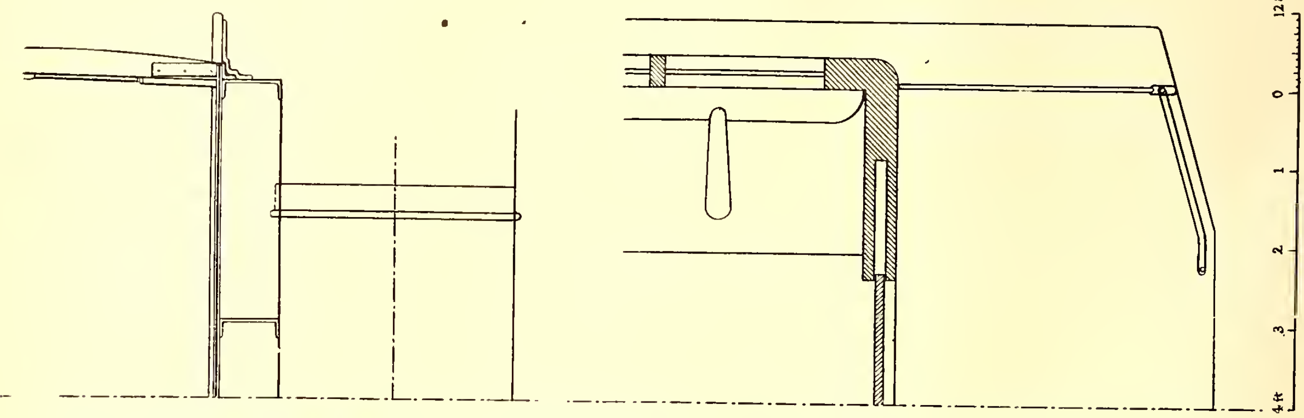


FIG. 1.—PLAN AND CROSS SECTION OF LONDON METROPOLITAN RAILWAY, SHOWING RUNNING BOARD

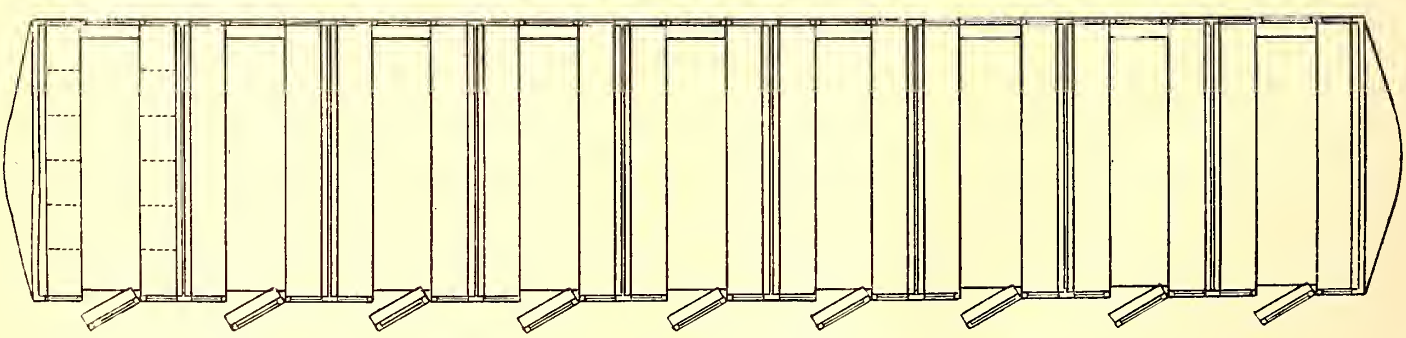


FIG. 2.—GREAT EASTERN RAILWAY, ENGLAND, THIRD-CLASS SUBURBAN CAR, 108 SEATS

practice, a large number of car types have been reduced to the same dimensions, viz.: length over all, 46 ft. 6¼ ins.; width at platform, 8 ft. 7 ins. A reduction of 77:1 has been given to the plans in this paper, so that the scale is 1 in. equals 6 ft. 5 ins. In order to adapt some foreign cars to these dimensions, radical changes have been necessary, so that the original types may not be recognized at once; but it will be seen that the relations between seats and doors have been preserved. As in Europe the motorman's cab is usually found only at the ends of a train, the accompanying designs are all for a middle car, though many have a cab. In place of European side buffers, blind platforms have been substituted. In addition to types now in use, several new ones are given, and the writer would like to see thoroughly criticised the type given in Figs. 22 to 24, which is an attempt to combine the best features of American can for city service, and the latter can hardly be operated safely where high station platforms are greatly curved, because of the wide space between the middle of the car and the platform edge. Now curved high platforms, while absent at the Illinois Central stations, are very common at English steam railway stations, and their dangers have been effectively met by the use of running boards filling up all spaces. The Manhattan type of car had no such advantage, until the Metropolitan Railway of London, in its new electric cars, most ingeniously applied the running board idea, as shown in Fig. 1. The car posts are carried on an angle fastened to the channel underframe. The car platforms project out still further on brackets, and are continued the whole length of the car by the projecting running board.

For suburban service, where time is not of such vital importance as capacity, no cars, of course, can equal the new wide rolling stock of the lines out of London. The Great Eastern Railway has been experimenting with a compound decapod locomotive which can accelerate a loaded eighteen-car train 1 m.p.h per second. With sixty seats to the 27-ft. cars, one such a train will carry 1080 seated third-class passengers, and, having the ability to attain a speed of 30 m.p.h. in thirty seconds, could probably hold its own against electricity for some time. This is a car with curved sides and swinging doors on each side, the latter, of course, operated by the passengers. Fig. 2 shows one of these cars lengthened out to the standard length adopted in this article for purposes of comparison, when it would have 108 seats.

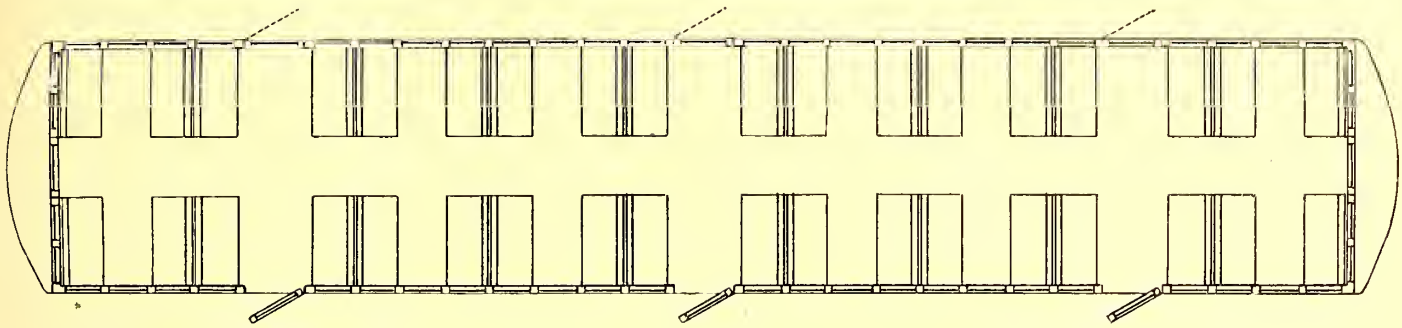


FIG. 3.—LIVERPOOL OVERHEAD RAILWAY, 72 SEATS

The lack of an aisle in the ordinary English steam cars was overcome in the electric trains of the Liverpool Overhead Railway (see Fig. 3). In spite of the small number of single side doors this car could probably handle more passengers than any American type, because of the many seats and their tendency to keep people away from the doors. The Liverpool station stops were found by the writer to average fourteen seconds, with a schedule speed of 19 m.p.h. Passengers are well distributed along the line, getting on mostly during the first half of trips and off the second half, the only heavy interchange of traffic occurring at the Pier Head, the middle station of the line; but the time lost there is easily made up during the rest of a run. The weight per seat of an empty three-car train is 809 lbs., against 790 lbs. for the New York Elevated local trains, 1251 lbs. for the New York Subway express trains, about 1590 lbs. with the new Boston Elevated cars, and 732 lbs. for the City & South London trains, including locomotive.

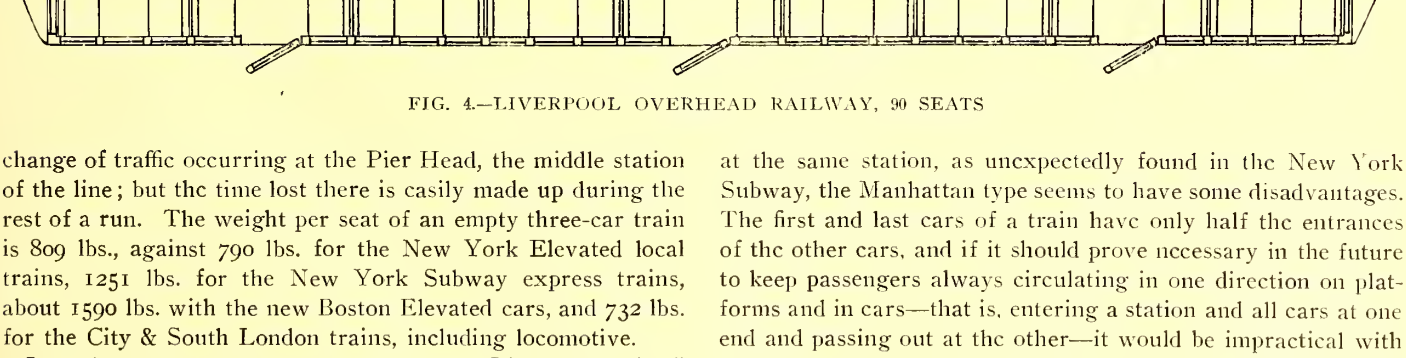


FIG. 4.—LIVERPOOL OVERHEAD RAILWAY, 90 SEATS

In order to get more seats to a car, one Liverpool train, I believe, was built wider at the seat level than at the floor (see Fig. 4), giving three seats on one side of the aisle, with two on the other. This economical way of widening did not affect any clearances, as other cars already had guard's windows projecting about 10 ins. beyond the panels, with a width over all of about 10 ft. 2 ins., though only 8 ft. 6 ins. wide at the platform.

The first underground cars in Paris had seats facing each other, as in Liverpool, with narrow side doors, sliding instead of swinging. The doors were later made double, and this arrangement is the one illustrated in Fig. 5, only that the greater width of car than that found in Paris allows two seats on each side of the aisle instead of one and two. This car is also 75 per cent longer than the Paris single-truck type. The schedule speed in Paris is much slower than in Liverpool, and the interchange of passengers much greater at stations, so that perhaps the wider doors justify the loss of seats. The stops average about thirteen and a half seconds. The reason why this car has so many less seats than the Liverpool type—though the similar plan of seats would seem to furnish the same—is that the Liverpool doors are very economically placed between passengers' knees, where but little additional room is needed; while the Paris doors, coming between seat backs, allow no such economy and have nearly twice the aggregate width.

The Manhattan type of car, with its open platforms and single end doors, has been greatly improved on in the new Metropolitan Elevated cars in Chicago (see Fig. 6) and the steel subway cars in New York. The enclosing of the platforms and the substitution of sliding doors for gates have remedied serious defects. With the Interborough cars the giving over of the whole front of the train to the motorman is in line with the universal European practice. But with very heavy traffic, and especially with many passengers getting both on and off at the same station, as unexpectedly found in the New York Subway, the Manhattan type seems to have some disadvantages. The first and last cars of a train have only half the entrances of the other cars, and if it should prove necessary in the future to keep passengers always circulating in one direction on platforms and in cars—that is, entering a station and all cars at one end and passing out at the other—it would be impractical with the front and rear Manhattan cars, and hindered by the cross seats in the others. Increasing congestion has made American passengers more and more impatient, especially of waiting for persons to get off cars before they get on, and if serious delaying conflicts are to be surely avoided perhaps either a regular circulation will have to be provided or else so many doors furnished that moving passengers will be widely distributed and tend to get on and off with less friction.

Perhaps this is a good place to introduce the question as to how rapidly passengers will enter a car at the ends. It will be remembered that the new steel subway cars in New York have sliding side doors with a 38-in. opening. This, considering the 44-in. inside opening, would seem enough to cause passengers to pass in or out two abreast, and so twice as rapidly as through the single doors of the wooden subway cars. Yet the writer, in timing the passage of people through both kinds of doors, has found the rate of movement only slightly faster through the single doors than through the double doors, even though passengers went two abreast at times through the latter. With doubly wide doors, why should not the rate be much more rapid? Various explanations have been suggested to answer this question. One is that the outside opening was not wide enough, that 48 ins. should have been allowed instead of 38 ins. Another is that at the adjacent ends of cars people cannot be fed rapidly enough to keep four going in or out at once. Then the passengers wishing to enter line up on each side of the door openings on the station platforms, tending to leave only a narrow lane for the outgoing crowd, and even if persons enter two abreast they may be obstructed by standing passengers or by those hunting for seats. Again, it has been suggested that if the door opening were plainly divided in the middle by a post, people would not tend to hesitate whether to pass through one or two at a time, any such chance for hesitation being usually ground to cause delay. The practicability of a post with sliding or folding doors raises some question, and perhaps it is best not to try to handle people two at a time at the end of a car, but to put in a middle door if construction and head room allow it.

Fig. 7 represents one of the original plans for the Metropolitan District cars, of London, with open platforms and gates. The final plans, as illustrated in the Street Railway Journal for March 4, 1905, page 419, provide for enclosed platforms with sliding doors and drop seats for unused openings. While the new electric cars of the Metropolitan Railway in London follow the Manhattan type closely, the Metropolitan District Railway has introduced middle doors, 46 ins. wide, in the whole arrangement, doubling the efficiency of the Manhattan plan. All the side doors will be operated by compressed air from the platforms, thus avoiding one of the most serious objections to middle doors, viz., the expense of platform men. As side doors have always been used in Europe, less stress is laid upon the weakening effect on construction from their use than would be the case in this country. As to the safety of operating middle doors from the car ends, the experience of the Boston Elevated Company has been that there is no danger.

The original plans for the car of the Great Northern & City Railway, London (see Fig. 8), provided for three seats on one side of the aisle, with two on the other, but only two seats on each side were finally adopted. The former arrangement has been followed here to illustrate a large possible seating capacity. Of the folding seats at the middle doors, only the one opposite the open door is counted in the tables. The width of the car requires curved sides. The sliding middle doors are intended for use only at the terminals.

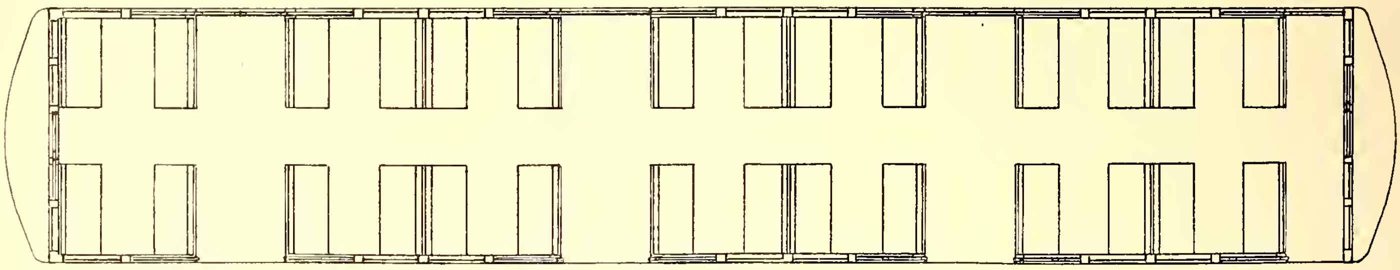


FIG. 5.—METROPOLITAN RAILWAY, PARIS, 56 SEATS

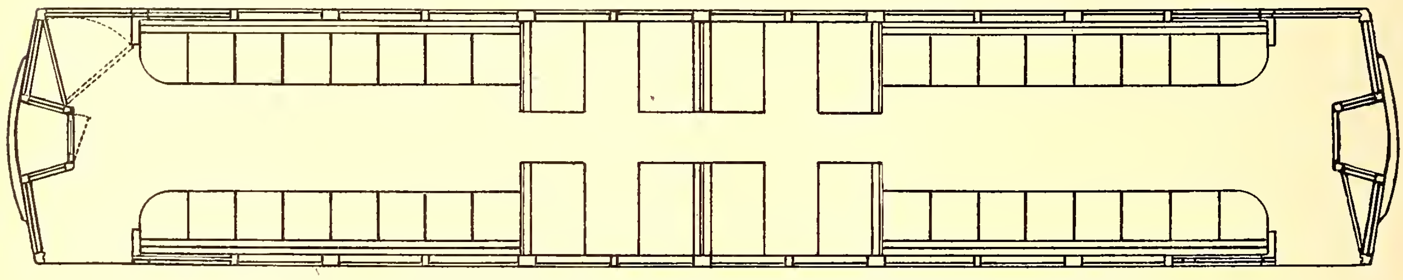


FIG. 6.—METROPOLITAN WEST SIDE ELEVATED RAILWAY, CHICAGO, 48 SEATS

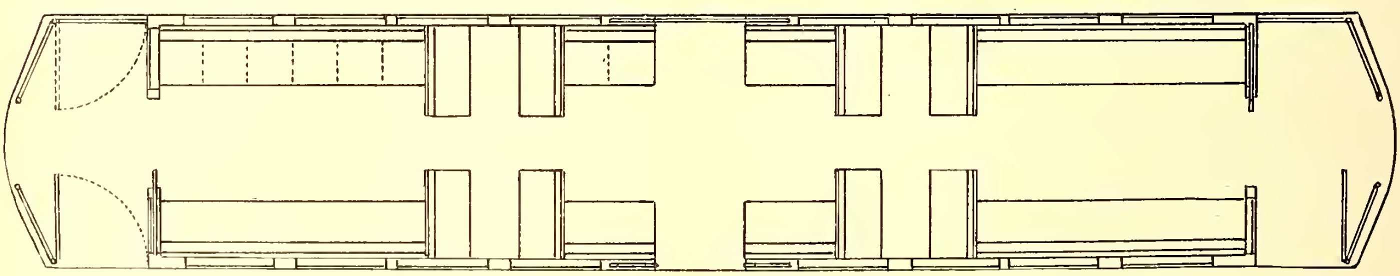


FIG. 7.—METROPOLITAN DISTRICT RAILWAY, LONDON, 48 SEATS

In the Lancashire & Yorkshire Railway, Liverpool, third-class car (see Fig. 9) we find the general plan of a vestibuled American steam car. The actual English cars have some steps at the entrances, which would be omitted, as drawn, with our high station platforms. The actual cars also have a partition, with a door, in the middle. Being 10 ft. wide over all, three seats are possible on one side of the aisle. The seats are reversible. The vestibules are closed by doors, not gates, and the doors all swing, and not slide. The windows are unusually large. While this car has wide entrances, it would, of course, be slow to load and unload because of the single center aisle, added to the many seats; but for a suburban electrified steam line this may not be of much importance.

The cross seat steam railroad type (see Fig. 10) affords a maximum of comfort in having cross seats facing forward, and with sliding side doors and inside partitions, with or without doors, drafts can be reduced to a minimum. If passengers wish to sit facing each other, the seats can easily be turned over, but no one has to ride backward unless he wishes to do so. Of course, no rapidity of circulation is possible in this type of car, especially if there are any standing passengers.

The longitudinal seat car shown in Fig. 11 appears to be an ideal one for the circulation of passengers in one direction

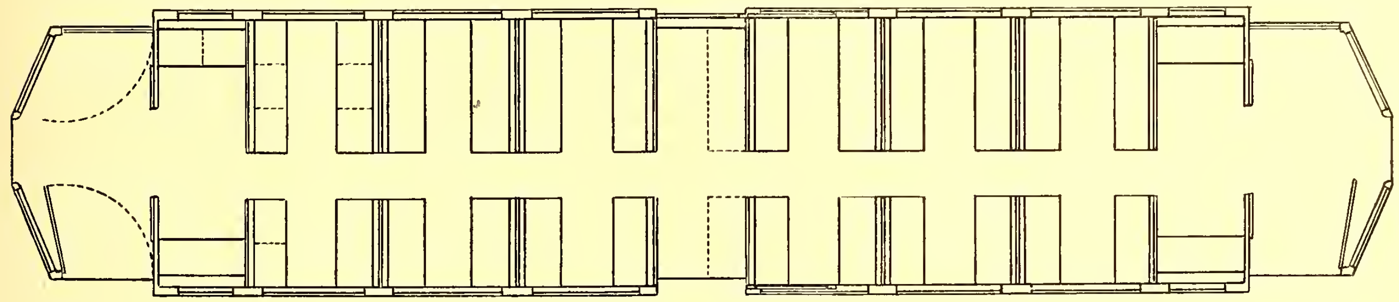


FIG. 8.—GREAT NORTHERN & CITY RAILWAY, 68 TO 73 SEATS

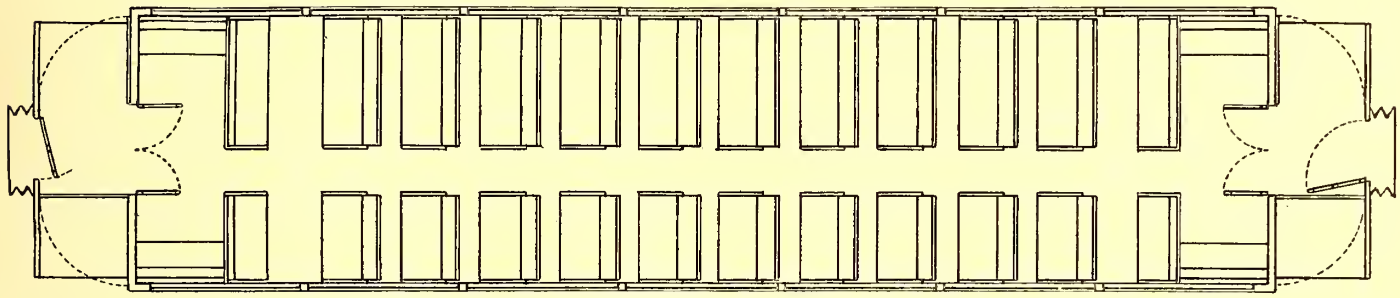


FIG. 9.—LANCASHIRE & YORKSHIRE RAILWAY, LIVERPOOL, THIRD-CLASS CAR, 72 SEATS

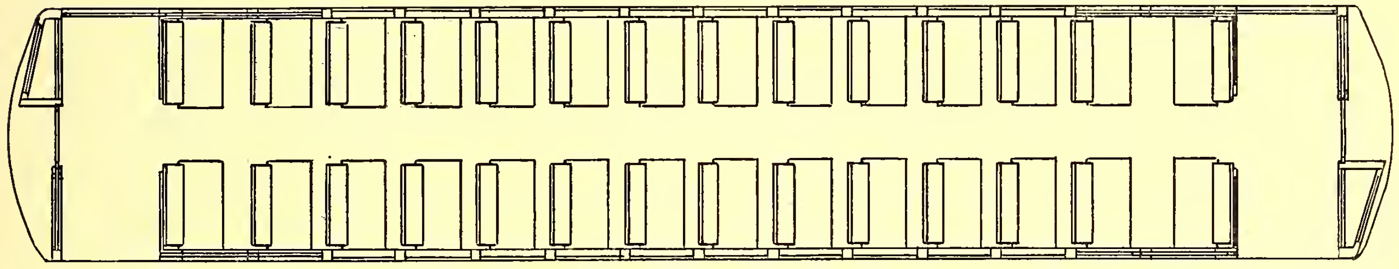


FIG. 10.—CROSS-SEAT CAR, STEAM RAILROAD TYPE, 56 SEATS

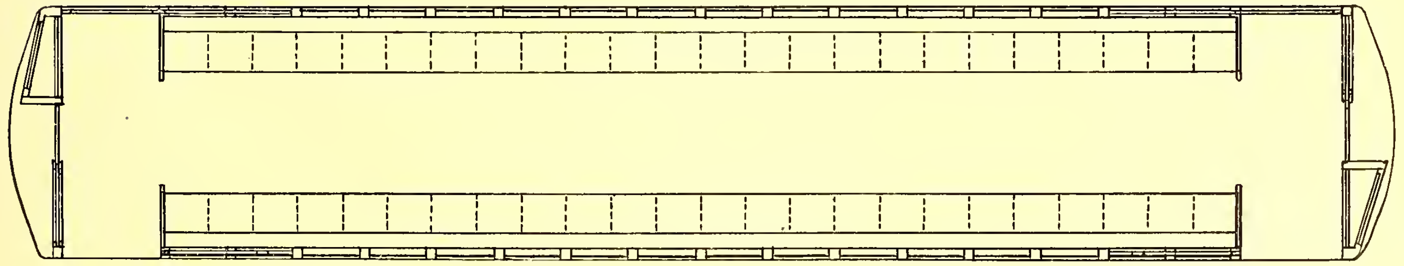


FIG. 11.—LONGITUDINAL SEAT CAR, 48 SEATS

through the car, but as persons would probably only move in single file through the entrances, the large interior space is effective only for standing, and any standing passengers in the aisle would tend to block through circulation. Indeed, the through circulation in one direction, suggested in connection with Fig. 6, would appear to be practical only where all persons were seated and the aisles kept free. The longitudinal seat car has its advantages, which are most strikingly illustrated on the City & South London Railway, where the tube diameters of 10 ft. 3 ins. and 10 ft. 6 ins. allow a height from the rail to the top of the car roof of only 8 ft. 4½ ins. The wheels of the double trucks are 24 ins. in diameter, and by using longitudinal seats the car floor has been dropped down between the wheels to a height of only 19½ ins. above the track, leaving a head room inside the car of about 6 ft. 6½ ins. The cars, of course, are all trailers, the physical conditions of the railway being such that locomotives have proved more satisfactory and economical in almost every way than motor cars could be.

The Berlin cars have already been described by the writer and illustrated in the Street Railway Journal for June 4, 1904. Attention can be called again to their generous allowance of seat space, as shown in Fig. 12. Every three passengers are also separated by a seat arm and post, thus giving many agreeable corners to sit in and to look out from through the large plate-glass windows. The posts used on this car furnish a far more desirable and a safer hold than straps. The main body of the car is separated from the outside sliding doors by glazed screens, but there are no platforms. On the end doors are single folding seats, which are not counted in the tables accompanying this article. Passengers open and shut the doors themselves, but though this undoubtedly tends to cause long stops, averaging twenty-two seconds, an average speed of nearly 17 m.p.h. is maintained. As with the City & South London, advantage was taken of the longitudinal seats to make a low and very compact car, which resulted in great economy in building the subway.

The Berlin car would look a little more regular if the doors were moved to the center of each half of the car, as has been done in Fig. 13. This brings the passengers in each quarter of the car at the same average distance from the doors. Screens can then shelter the seats each way. The gain in seats over the original Berlin car, which has forty-four seats, is due to removing the arms and allowing 18 ins. per passenger instead of over 20 ins. One advantage of the end door type is lost here, viz., having the entrances practically within reach of the guard; but this advantage is less important with the latest sliding doors, where a passenger can hardly get caught and hurt, than with the ordinary gates where the platforms frequently get blocked.

If we take the same car and use cross seats, as in Fig. 14, we can secure four more seats than in the car shown in Fig. 13, without really cutting down the facility of loading, for we have the condition of a single narrow aisle which can be entered by four passengers at once. Circulation in one direction could be secured fairly well if the passengers who are leaving the car should collect at the forward door before stops, and should enter promptly by the rear door only.

The last three cars show the relative seating capacity afforded by three principal methods. Where longitudinal seats require 18 ins. of car length per passenger, reversible cross seats get along with even 15 ins., and seats facing each other with as little as 13½ ins., though 15 ins. is better, always affording four more seats per car than ordinary cross seats. Where seats face each other, no foot rests are possible, and their general use might make passengers complain of having to ride backward; but the ease of access to such seats, their compactness and freedom from turning over recommend their greater use in this country. Fig. 15 shows such a type of car with two side doors and seats for sixty-four passengers.

The latest elevated cars in Boston (Fig. 16) are obviously ideal in some ways for the circulation of passengers. The middle doors, however, have hitherto required platform men to each car at each station to open and close them, at great expense, although on one train they are now being operated most successfully by the guards from the car ends by compressed air, with an automatic starting signal when every door is closed. Allowing about 16½ ins. of seat room per passenger, the Boston cars would seat forty-eight, but the 18-in. space

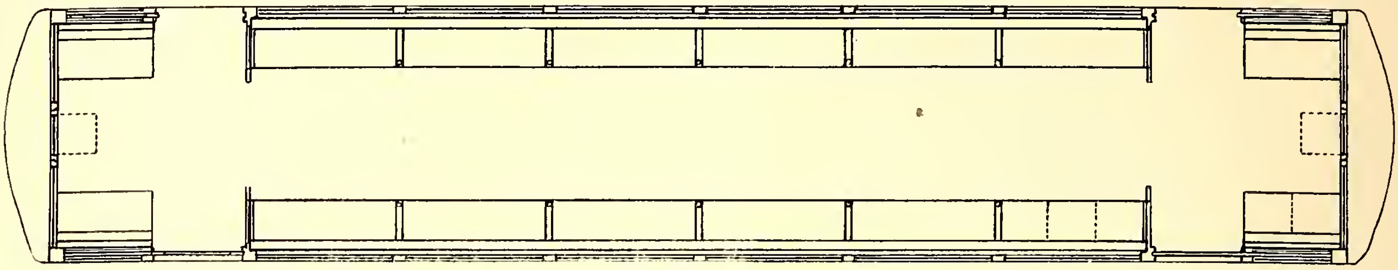


FIG. 12.—BERLIN ELEVATED AND UNDERGROUND RAILWAY, 44 SEATS

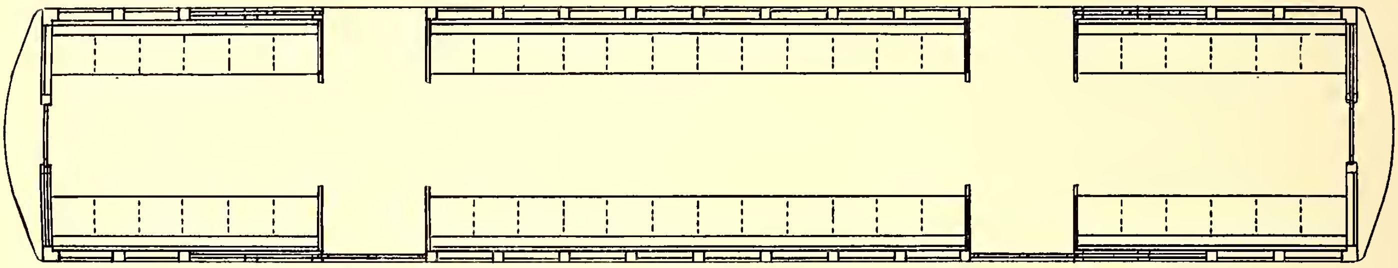


FIG. 13.—QUARTER DOOR, LONGITUDINAL SEAT CAR, 48 SEATS

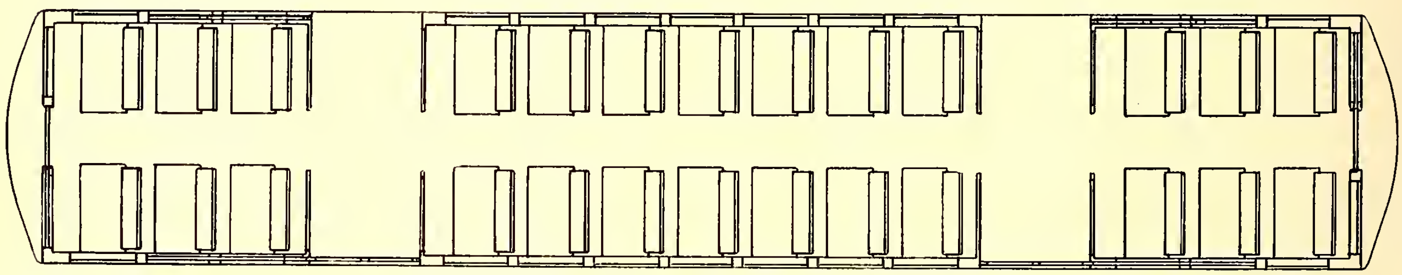


FIG. 14.—QUARTER DOOR, REVERSIBLE SEAT CAR, 52 SEATS

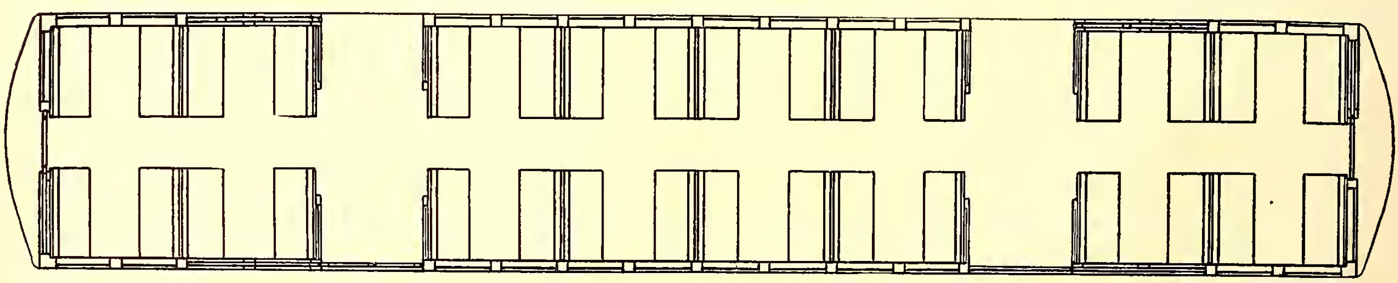


FIG. 15.—QUARTER DOOR CAR, CROSS SEATS FACING, 64 SEATS

used here for comparative purposes allows only forty-four seats, which is the actual number usually occupied, the cushions being continuous and not divided. The wide aisle allows considerable space for circulation or standing passengers, but it has the disadvantage of furnishing nothing solid to get hold of or lean against, so that the frequent curves of the Boston subway and streets tend to make passengers stand at the doors, where there are some handles, and so obstruct the openings. The introduction of vertical posts along the seats, as in Berlin, would at the same time, but this is better provided for in Fig. 19. Passengers standing along the platform should keep close to the car and enter by the nearest door and aisle. Passengers would leave by the further aisle, passing out the center door to the further side of the station platform, out of the way of those boarding.

The straight Illinois Central type of car (Fig. 20) has the advantage over this last car of twice as much entrance space per seat, and its spreading out of passengers at so many single

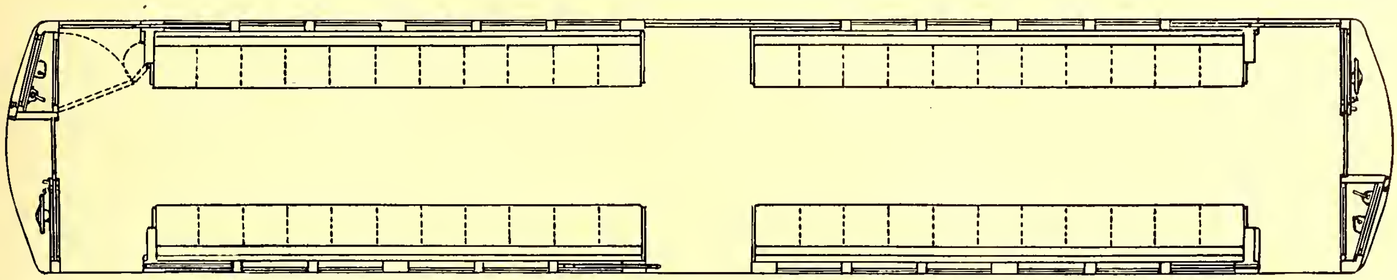


FIG. 16.—LATEST TYPE OF BOSTON ELEVATED CAR, 44 SEATS

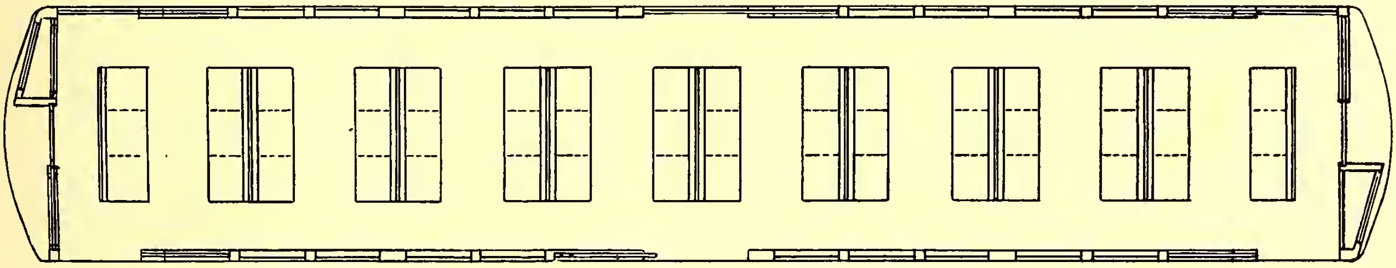


FIG. 17.—CAR WITH BOSTON ENTRANCES AND ILLINOIS CENTRAL SEATS, 48 SEATS

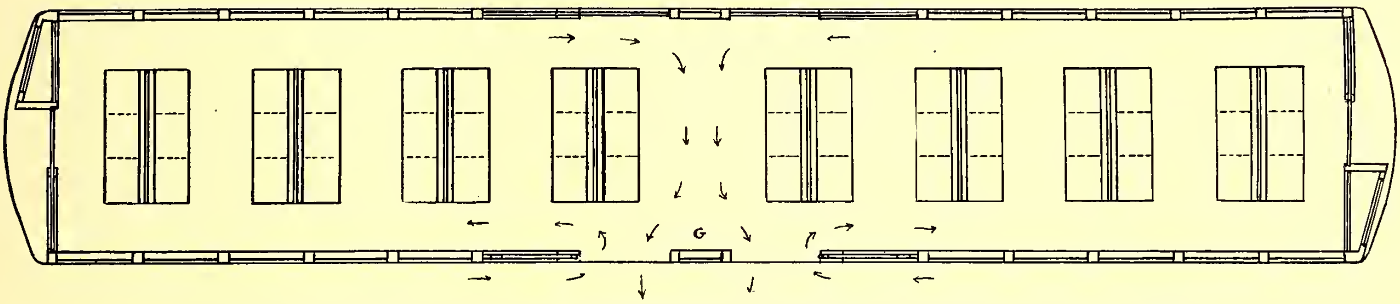


FIG. 18.—CAR WITH TWO CENTER ENTRANCES AND ILLINOIS CENTRAL SEATS, 48 SEATS

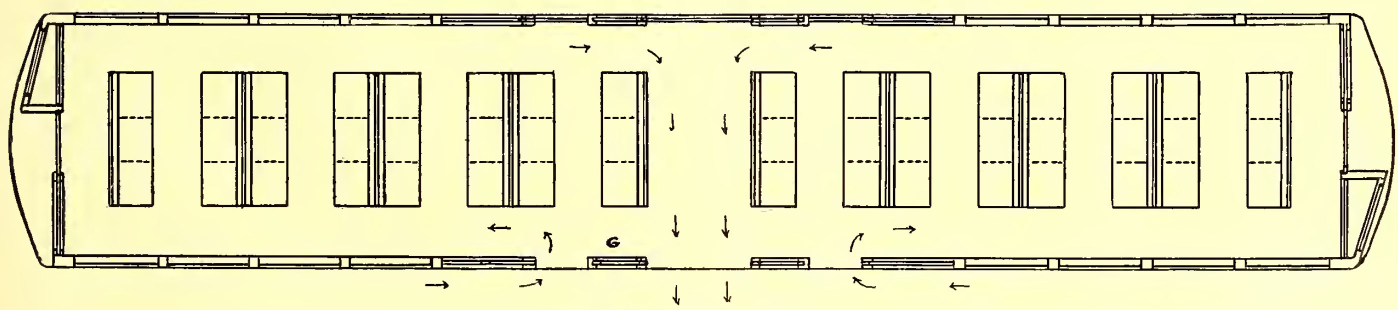


FIG. 19.—CAR WITH THREE CENTER ENTRANCES AND ILLINOIS CENTRAL SEATS, 48 SEATS

seem to be an advantage and keep the passengers from being thrown over by unexpected curves or stops. The Berlin arms could be omitted to save space. Another possible change would be to arrange the seats as in the Illinois Central cars, facing each other between two side aisles, as in Fig. 17. Here standing passengers have more to take hold of and there is a gain of four seats, or three when the cab is in use. But the distance of the middle door from the guard at the end of the car suggests another arrangement of doors, as in Fig. 18, where the guard stands between two wide side doors and can see and regulate things better than with the end doors alone. The arrows indicate how passengers might enter and leave the car openings should tend to make them go in and out with less friction and confusion. If the guard stands at the rear of each car, at the side, he can look along the platform more easily than with ordinary types, and has only to look in one direction. Now, the two-aisled car seems all right if nobody has to stand. But the minute that people begin to stand in an aisle its usefulness obviously begins to diminish. One clear aisle is better than two filled with people. And if only twelve people have to stand in a forty-eight-seat car, might it not be an advantage to throw one aisle into seats, putting the other aisle into the middle of the car?

This has been done in Fig. 21, where the Boston Elevated entrances are combined with the vis-a-vis seat, and where sixty seats can be in use at one time. But, for seats facing each other, the Illinois Central side doors seem better than this combination of end and middle doors.

For the severest conditions of American city traffic none of the preceding types of cars seems satisfactory in every way. Many of them are all right with a small number of passengers, or with plenty of time for stops. The capacious Great Eastern type has no aisles, and its swinging side doors, which are similar to those used with the Liverpool cars, might make trouble in this country. The chief difficulty with American cars comes when passengers have to stand, for that is the beginning of the blocking of circulation and friction, which ends in loss of time, wages, current, etc., and often causes accidents. The extra expense caused by the overcrowding and consequent delay of a single train is surprising. The trouble with providing a maximum amount of standing room and a minimum number of seats is that standing begins too soon and may hinder speed all day long. If passengers in this country would only learn, as they are compelled to in Europe, not to take the first car or train if it is very crowded, it would help things very much. Since his last trip to Europe, the writer has often tried letting a crowded car or train, or two, go by, with quite satisfactory results. But, of course, if people insist on bunching themselves it is of little use to run empty cars. It seems as though the time had come for more regulation and education in this matter. The persuasion of guards is not enough. People would soon learn to allow a little more time for reaching places. But the writer is convinced that the easiest and best way in the future to keep entrances clear is to give passengers more seats out of the way, as has been done on the Liverpool Overhead Railway, only furnishing more entrances, as has been best done in the Illinois Central cars.

To make the Illinois Central car a success it is evidently necessary to keep passengers from hunting for seats before they enter, and to do this effectively one aisle should be kept clear of standing people. With a heavy interchange of traffic at stations it might prove difficult, with only forty-eight seats in a car, to keep passengers from standing in the aisle close to the doors in use, and even if there were no standing passengers those persons hunting for seats might get in the way of those just entering the doors. So a two-aisled plan might not work well for city traffic. Now, if a single aisle is provided in the center of the car, not only is the seating capacity increased 25 per cent, and the aisle more likely to be kept open, but there would be more floor space for entering passengers to fill inside a car before hunting for seats began. So the writer, in looking for an improved plan, abandoned the two aisles for one, as in Fig. 22. This is the first study for a steel type of car. The plan will be criticised at once on the ground that there is too much passing in front of passengers to get anywhere in the car; but, in second thought, it will be seen that there is really no more passing in front of people than in a two-aisled car, and only half as much as in an open car. Passengers anyway would probably tend to sit in the seats away from the doors. To keep those passing by off the feet and knees of those seated, the doorway would furnish one guide, and brackets have been added to the inside seat ends, following an ingenious feature of the Berlin Elevated cars. The end vestibules are partitioned off from the body of the car, and are solely for employees and apparatus. The motorman would, of course, use the front vestibule of each train, the guard the rear one of each car, operating the side doors, as on the Illinois Central, either mechanically or by compressed air valves at *A*, *B*, *C* or *D*, calling station names through a partition window through which he could see when all leaving passengers were out of the car. For the guard to look along the platform without having to open a door or window, four glass bay windows have been provided, after the common English fashion, as found on the Liverpool Overhead Railway. On the partition doors folding seats can be placed, as in Berlin. End doors are furnished at the ends of the cars between heavy vertical angle irons to prevent telescoping. Of course, the partitions can have sliding doors, and the cars can be vestibuled if desired; but in Boston passing between cars has been prevented on the new trains in order to reduce accidents. The floor construction of the Illinois Central cars has been followed in this case. The door details might follow Boston Elevated practice, with an automatic starting signal, not given, of course, till every door is tightly closed.

To facilitate safe moving about the car and encourage passengers to stand ready to get out, vertical posts are provided, not only on the top of each seat back, as in the Swiss Saint Gotthard Railway cars and the Paris Metropolitan, but further posts are added at the outer corners of the seats next to the aisles, just inside the brackets. The windows can be lowered from the top, and those in the doors are also movable. The lower line of transoms can be opened inward at the top by passengers, as in the latest English electric cars and German steam cars. The seat ends would be of ornamental pressed

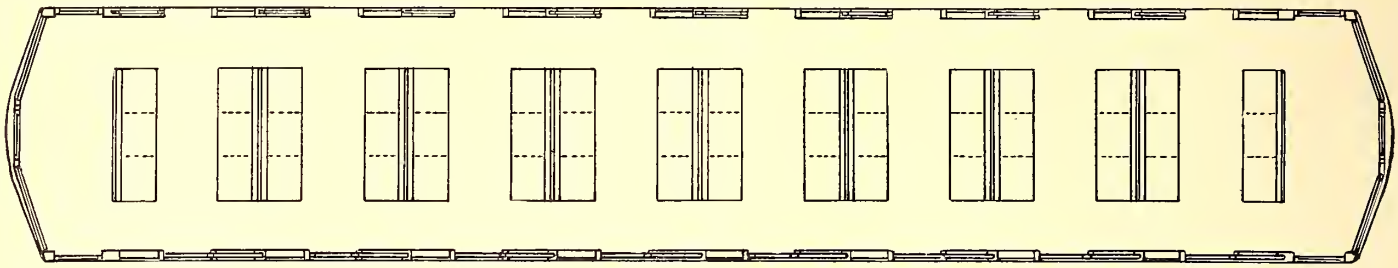


FIG. 20.—ILLINOIS CENTRAL TYPE, 48 SEATS

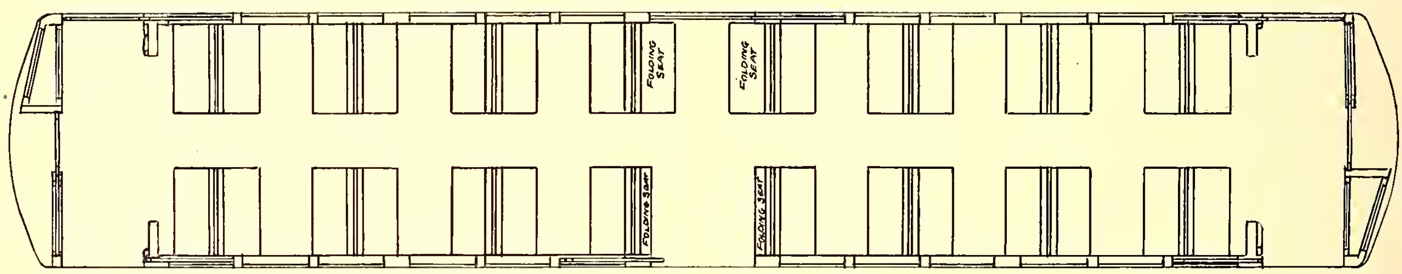


FIG. 21.—BOSTON ELEVATED ENTRANCES, BUT WITH CROSS SEATS FACING, 60 SEATS

steel. The seats themselves would be constructed after the European practice as found on the City & South London Railway and London United Tramways, whose seats are better than anything yet in use in this country. The exterior design follows the lines of the Midland Railway cars of England, which seem to meet the conditions in an attractive manner.

If it should seem desirable to have a circulation of passengers in one direction through the car, they might pass forward in the car just before reaching a station, and then out through the four leading doors, all entering being by the four rear doors. As side door cars are not too cold on the lake front of Chicago, they ought to be satisfactory for subway, or even elevated service, especially if the elevated platforms are covered and enclosed, as in Paris, or better, as in Berlin, where inexpensive steel roofs span both tracks and platforms above and glass-lighted side walls are used.

While this new car has 50 per cent more seats than that shown in Fig. 16, it is possible to gain still more seating capacity by widening the upper part of the car, as in Liverpool. This would provide sixteen extra seats, the car floor being the same. Fig. 23 shows the changes, the seat arms, some posts and the bay windows being omitted. As the curved sides would not be as satisfactory as straight, the construction may finally be changed to that of the London Metropolitan cars, as shown in Fig. 24, where the transoms and better appearance of Fig. 22 have been restored. The straight vertical posts would be carried on an angle fastened to the steel underframe, with a clearance above the platform sufficient to allow for the breaking of a spring. The increased height of the car floor, as now often found in this country and in Europe, would be compensated for by the absence of any gap between platform and car in most cases.

The carrying capacity of Fig. 24 may be illustrated by what it might do at the Brooklyn Bridge. The bridge trains are obliged to carry in a single rush hour as many as 35,000 passengers. But if the terminals were fully utilized it appears that the capacity of the railway tracks could be not less than 41,600 seats an hour, if elevated cars of the new type were used, running with the present headway, or 50,000 seats an hour if special bridge cars were used, the trains loading or unloading from one side only in ten or twelve seconds. It should be noted that cars with side doors between seats facing each other are the only cars that can be loaded and unloaded simultaneously by means of two station platforms without taking more time than loading or unloading separately.

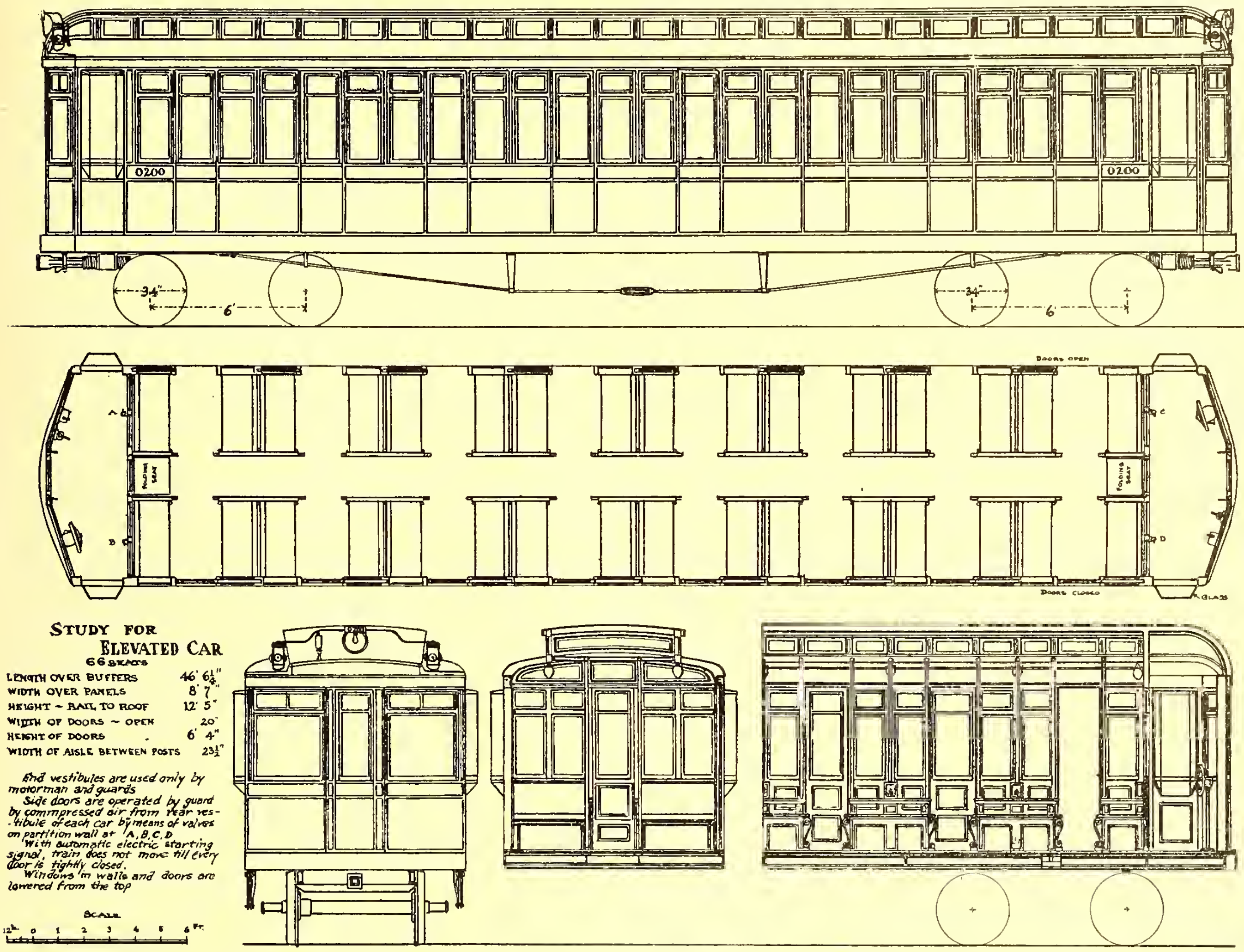
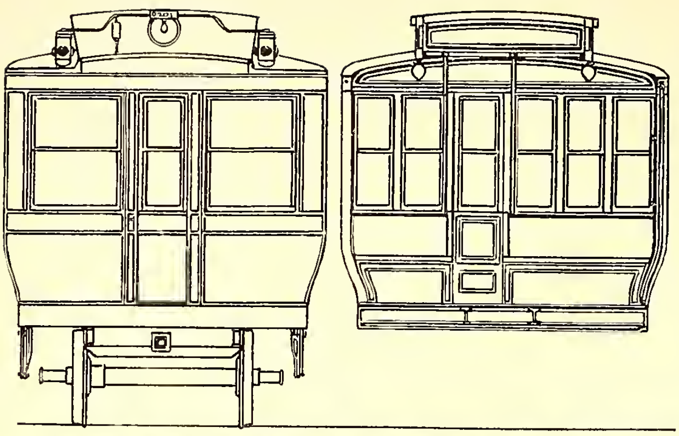


FIG. 22.—PROPOSED CAR WITH EIGHT SIDE DOORS AND CENTER AISLE, 66 SEATS

The large seating capacity of the modified Illinois Central car, shown in Fig. 24, makes it look very inviting for suburban steam or electric service. A 60-ft. body would allow 120 seats against the ordinary eighty. With a vestibuled train one guard might operate the side doors of two cars. The end partitions could have sliding doors, and the vestibules have trap doors, steps and swinging outside doors, which could be brought into use at stations where high platforms were undesirable. Passengers might use the car steps at way stations and have the side doors opened only at terminals. The introduction of a third person on one seat might be objected to, but a passenger would probably prefer to sit there to standing, and we never think of really objecting to sitting between passengers on an open car, though longitudinal seats are growing in disfavor. But would people consent to ride backward, as they do on the Illinois Central? It is argued that vis-a-vis seats have been practically abandoned on street cars in this country, in spite of their economy of space and that the bulkhead seat of open cars is always the last to be filled. But it must be remembered



ber of both is not desired, it may be best for suburban service to continue the present steam car type, with the addition, for electric service, of wide vestibuled platforms, as on interurban cars.

As an example of the most capacious type of car in Europe, though obviously impractical for American rapid transit purposes, a design is added in Fig. 25, following the lines of the latest double-deck steam cars of the Ouest Railway of France, which affords 168 seats for the standard length of 46 ft. 6 ins. Double-deck steam cars have been used for many years on the lines out of Paris, as well as in Denmark and Egypt. The upper deck of this car is wholly enclosed, and is reached by open stairs going up from each side at the ends. Though the wheels are 39½ ins. in diameter, the height of the French car from rail to roof is only 14 ft. 6 ins., the French preferring to have seats enough even if cramped vertically, while the Americans are crowded horizontally. On the Ouest Railway on Sundays sometimes 1500 people ride on one train of double-deck cars. Passengers climb stairs at the rate of about one in two seconds.

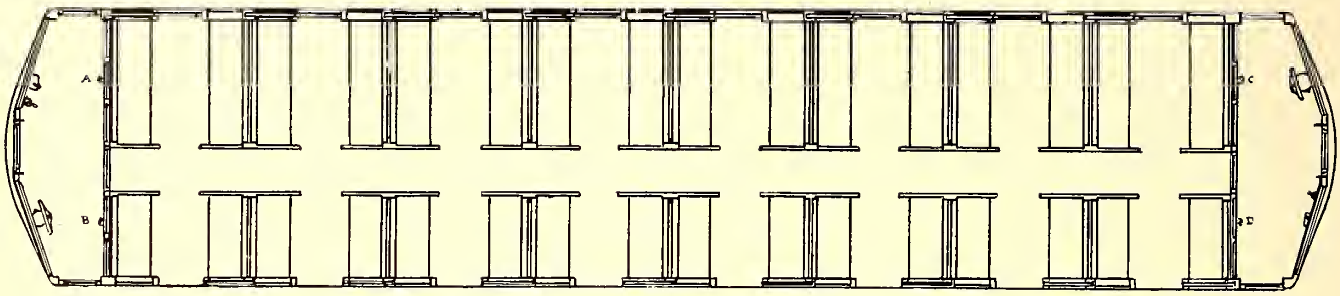


FIG. 23.—PROPOSED CAR WITH EIGHT SIDE DOORS AND CENTER AISLE, 82 SEATS

that vis-a-vis seats have not always been well designed, especially as regards the backs; that they are still in use on many elevated cars and all Pullman sleeping cars, and that they are universal and very popular on all European railroad cars, which are often more comfortable as regards seating than our parlor cars. The writer believes that if European seat construction were followed, both in cushions and backs, passengers would learn to forget their previous habits. Still, if suburban cars are never by any possibility to use a subway or elevated system, if the terminal stop for either loading or unloading will never be less than a minute, and if greater economy in the number of cars and men or larger capacity for the same num-

The best test of the carrying capacity of a car seems to be the number of passengers it can handle at a terminal, and in the accompanying tables all the foregoing types of cars have been classified in this way. With a given number of persons to be loaded or unloaded at stations it is obvious that the length of stops will depend on the number of car entrances. If the headway is two minutes or more and the length of stops not very important, as on long or fast runs, of course the entrances can

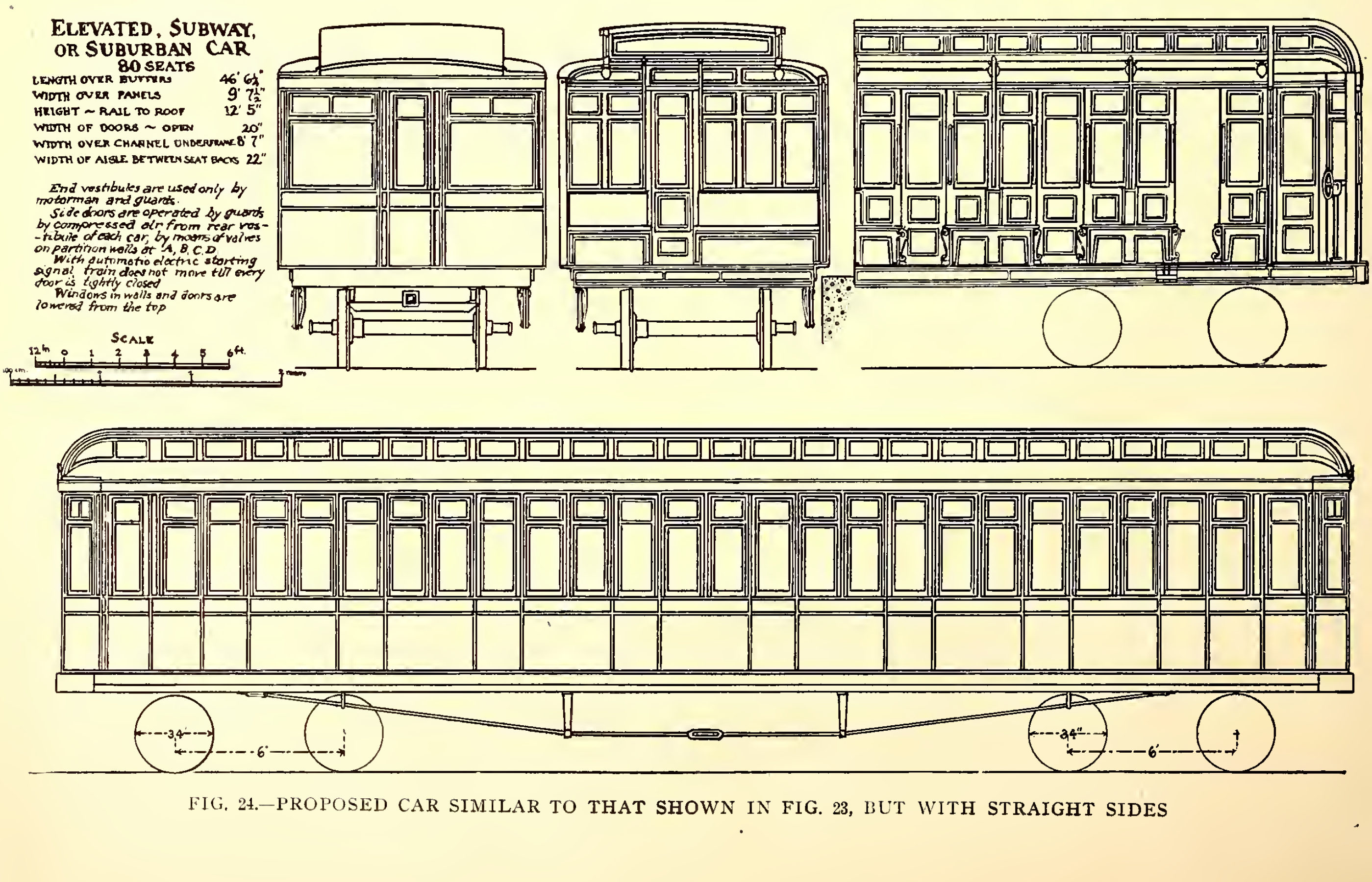


FIG. 24.—PROPOSED CAR SIMILAR TO THAT SHOWN IN FIG. 23, BUT WITH STRAIGHT SIDES

TABLE I.—GENERAL COMPARISON OF THE CARRYING CAPACITY OF THE CARS DESCRIBED IN ACCOMPANYING ARCTICLE.

Maximum Seats Per Hour.

Rank.	Fig.	Name.	Seats Per Car.	Seats Per Hour.
1	2	Great Eastern Ry., London	108	7452
2	24	New type	80	5760
3	25	Ouest Ry., Paris	168	5376
4	4	Liverpool Overhead Ry	90	4590
5	8	Gt. Northern & City Ry., L..ondon	71	4402
6	5	Paris, Metropolitan Ry	56	4200
7	15	Quarter door, cross facing seats	64	4096
8	3	Liverpool Overhead Ry	72	4032
9	21	Boston, cross facing seats	60	3900
10	20	Illinois Central type	48	3744
11	14	Quarter door, cross seats	52	3484
12	9	Lancashire & Yorkshire Ry	72	3384
	7	Metropolitan District Ry., London	48	
	13	Quarter door, longitudinal seats	48	
13	17	Boston, cross facing seats, I. C. R. R.	48	3312
	18	Two center doors, I. C. R. R. seats	48	
	19	Three center doors, I. C. R. R. seats	48	
	12	Berlin Elevated Ry	44	
14	16	Boston, latest type	44	3080
	..	Boston, oldest type	44	
15	10	Steam railroad type	56	2912
	6	Chicago, Metropolitan Elevated Ry	48	
16	..	Manhattan Elevated type	48	2688
	11	End door, longitudinal	48	

30 Cars Per Hour.

Rank.	Fig.	Name.	Seats Per Car.	Seats Per Hour.
1	25	Ouest Ry., Paris	168	5040
2	2	Great Eastern Ry., London	108	3240
3	4	Liverpool Overhead Ry	90	2700
4	24	New type	80	2400
5	3	Liverpool Overhead Ry	72	2160
	9	Lancashire & Yorkshire Ry	72	
6	8	Gt. Northern & City Ry., London	71	2130
7	15	Quarter door, cross facing seats	64	1920
8	21	Boston, cross facing seats	60	1800
9	5	Paris, Mertopolitan Ry	56	1680
	10	Steam railroad type	56	
10	14	Quarter door, cross seats	52	1560
	6	Chicago, Metropolitan Elevated Ry	48	
	..	Manhattan Elevated type	48	
	7	Metropolitan District Ry., London	48	
	11	End door, longitudinal seats	48	
11	13	Quarter door, longitudinal seats	48	1440
	17	Boston, cross facing seats, I. C. R. R.	48	
	18	Two centre doors, I. C. R. R. seats	48	
	19	Three centre doors, I. C. R. R. seats	48	
	20	Illinois Central type	48	
	12	Berlin Elevated Ry	44	
12	16	Boston, latest type	44	1320
	..	Boston, oldest type	44	

60 Cars Per Hour

Rank.	Fig.	Name.	Seats Per Car.	Seats Per Hour
1	25	Ouest Ry., Paris	168	6960
2	2	Great Eastern Ry., London	108	6480
3	24	New type	80	4800
4	8	Gt. Northern & City Ry., London	71	4260
5	15	Quarter door, cross facing seats	64	3840
	3	Liverpool Overhead Ry	72	
6	4	Liverpool Overhead Ry	90	3600
	21	Boston, cross facing seats	60	
7	5	Paris, Metropolitan Ry	56	3360
8	14	Quarter door, cross seats	52	3120
	7	Metropolitan District Ry., London	48	
	13	Quarter door, longitudinal seats	48	
9	17	Boston, cross facing seats, I. C. R. R.	48	2880
	18	Two centre doors, I. C. R. R.	48	
	19	Three centre doors, I. C. R. R. seats	48	
	20	Illinois Central type	48	
	12	Berlin Elevated Ry	44	
10	16	Boston, latest type	44	2640
	..	Boston, oldest type	44	
	6	Chicago, Metropolitan Elevated Ry	48	
	..	Manhattan Elevated type	48	
11	9	Lancashire & Yorkshire Ry	72	2400
	10	Steam railroad type	48	
	11	End door, longitudinal seats	48	

TABLE II.—DETAILS OF ALL TYPES OF CARS DESCRIBED, WITH CARRYING CAPACITY IN SEATS PER HOUR.

Fig.	City.	Company.	No. of Seats.	Type of Car.	Electric or Steam.	Kind of Seats.	Kind of Doors.	No. of Passengers on at Once.	Maximum Seats Per Hour. Time to Load.	Length of Block.	Total Headway.	Cars Per Hour.	Seats Per Hour.	Rank.	30 Cars Per Hour. Seats Per Hour.	Rank.	60 Cars Per Hour. Seats Carried.	Seats Filled on Each Car.	Seats Filled Per Hour.	Rank.
									Sec.	Sec.	Sec.									
2	London	Great Eastern Ry.	108	Wide suburban	Steam	Cross facing	Side	9	12	40	52	69	7452	1	3240	2	6480	108	6480	2
3	Liverpool	Overhead Ry.	72		Electric	Cross facing	Side	3	24	40	64	56	4032	8	2160	5	4320	60	3600	6
4	Liverpool	Overhead Ry.	90		Electric	Cross facing	Side	3	30	40	70	51	4590	4	2700	3	5400	60	3600	6
5	Paris	Metropolitan Ry.	56		Electric	Cross facing	Side	7	8	40	48	75	4200	6	1680	9	3360	56	3360	7
6	Chicago	Metropolitan Elevated	48	Manhattan	Electric	Long. and C. F.	End	2	24	40	64	56	2688	16	1440	11	2880	40	2400	11
	New York	Manhattan Elevated	48	Manhattan	Electric	Long. and C. F.	End	2	24	40	64	56	2688	16	1440	11	2880	40	2400	11
7	London	Metropolitan District	48		Electric	Long. and C. F.	End and centre	4	12	40	52	69	3312	13	1440	11	2880	48	2880	9
8	London	Gt. Northern & City	71		Electric	Long. and C. F.	End and centre	4	18	40	58	62	4402	5	2130	6	4260	71	4260	4
9	Liverpool	Lancashire &Y'shire	72		Electric	Cross	End	2	36	40	76	47	3384	12	2160	5	4320	40	2400	11
10			56	Steam railroad		Cross	End	2	28	40	68	52	2912	15	1680	9	3360	40	2400	11
11			48			Longitudinal	End	2	24	40	64	56	2688	16	1440	11	2880	40	2400	11
12	Berlin	Elevated Ry.	44		Electric	Longitudinal	Quarter	4	11	40	51	70	3080	14	1320	12	2640	44	2640	10
13			48			Longitudinal	Quarter	4	12	40	52	69	3312	13	1440	11	2880	48	2880	9
14			52			Cross	Quarter	4	13	40	53	67	3484	11	1560	10	3120	52	3120	8
15			64			Cross facing	Quarter	4	16	40	56	64	4096	7	1920	7	3840	64	3840	5
16	Boston	Elevated Ry.	44	New	Electric	Longitudinal	End and centre	4	11	40	51	70	3080	14	1320	12	2640	44	2640	10
	Boston	Elevated Ry.	44	Old	Electric	Longitudinal	End and centre	4	11	40	51	70	3080	14	1320	12	2640	44	2640	10
17	Boston	Elevated Ry.	48	New, remodeled	Electric	Illinois Central	End and centre	4	12	40	52	69	3312	13	1440	11	2880	48	2880	9
18			48			Illinois Central	Two centre	4	12	40	52	69	3312	13	1440	11	2880	48	2880	9
19			48			Illinois Central	Three centre	4	12	40	52	69	3312	13	1440	11	2880	48	2880	9
20	Chicago	Illinois Central R. R.	48	Side door suburban	Steam	Illinois Central	Side	8	6	40	46	78	3744	10	1440	11	2880	48	2880	9
21	Boston	Elevated Ry.	60	New, remodeled	Electric	Cross facing	End and centre	4	15	40	55	65	3900	9	1880	8	3600	60	3600	6
24			80			Cross facing	Side	8	10	40	50	72	5760	2	2400	4	4800	80	4800	3
25	Paris	Ouest Ry.	168	Double deck	Steam	Cross facing	End and side	10	72	40	112	32	5376	3	5040	1	10080	116	6960	1

be few in number and subordinated to other features. In classifying the different types a rate of loading or unloading has been assumed of one passenger per second through each single opening, and two per second for each double opening, except where the latter occurs at the car ends, where apparently, as already discussed, all openings as at present constructed can only be counted as single. It may be questioned whether double openings elsewhere should be counted as such, but the writer has found persons passing through the Boston Elevated middle doors at the rate of twenty in thirteen seconds, forty-four in twenty-eight seconds, etc., and so will assume for the present the rate of two persons a second. For single car doors the writer has records of each passenger, taking 1.38 seconds in Boston and 1.10 seconds in the New York Subway, and hopes that one second will be accepted as a satisfactory seats as customary to-day for the same total operating expenses, it seems well to consider whether the time has not come for the adoption of the steam road practice of always furnishing more seats than there are passengers, and so attracting all possible business. There is nothing that has hurt electric railway traffic so much in our cities as overcrowding. Evening traffic is especially sensitive; ladies in evening dress do not like to be roughly handled, and one disagreeable experience may keep them off the cars at night for some time. While the limit of a rapid transit line and terminal with eight-car trains is about 50,000 seats an hour, the limit of a city street and terminal is about 40,000 seats an hour in one direction, as will be shown in a later article.

To return to the matter of car comparisons, in the accompanying tables a terminal is assumed at which cars load through

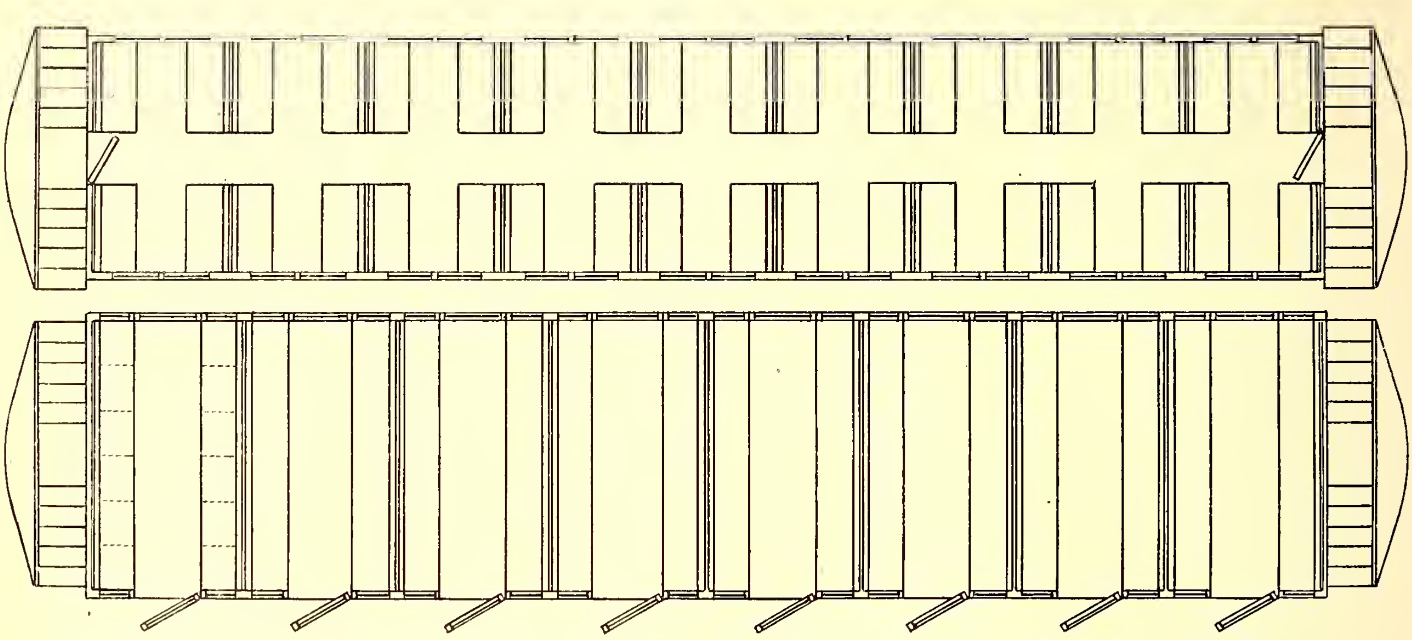


FIG. 25.—OUEST RAILWAY, PARIS, DOUBLE-DECK STEAM CAR, 168 SEATS

ideal rate. The number of passengers allowed to a car is the number of seated passengers only, a limit which will doubtless be criticised. But if a standing load is to be figured on it seems impossible to assume any satisfactory uniform rate of loading, because the obstruction to movement caused by standing passengers would probably vary the loading rate differently for each type of car, depending on width of openings, handles, posts, direction of aisles, etc., the effect of which could only be told by actual experiment with all the types under the same conditions. Suppose it were necessary to carry away 46,080 passengers an hour from a terminal. The type of car in Fig. 24 could do it and give every passenger a seat with eight-car trains, whereas it seems doubtful if the types with few seats and large standing room could in any way handle so many people, no matter how closely packed, because the entrances would be too few to get them on in time, besides which the early beginning of standing would soon reduce the rapidity of loading and finally stop it altogether before all the people were on.

In regard to the matter of standing, the writer has been studying its aspects for several years, both in this country and Europe, discussing it with some of the best experts on both continents, and feels now, as do so many practical men in this country, that it has been greatly overdone, and has been the cause of much loss of business, higher operating expenses and serious accidents. Now that it appears possible in the future, even with the worst congestion, to furnish in some cities all day long, and even at the rush hours, at least twice as many all doors on one side only, and are operated with a block-signal system, which causes a train to take twenty seconds to run from the home signal to a full stop at the station, and another twenty seconds from the time of leaving the station till the home signal is clear for the next train to run in. Only, instead of trains, the capacity of cars run singly is taken to make the figures smaller. The first column in Table I. shows the maximum number of passengers that can be carried away from the terminal by stopping each car just long enough to fill the seats. In this case a slow loading car is at a disadvantage, unless it has a great many seats. The second column assumes a two-minute headway, which allows time enough for the slowest type to fill its seats, so that the cars come out grouped in order according to their seating capacity. The third column assumes a minute headway, and here again the number of entrances, combined with the largest number of seats, show their importance. In practice, the Ouest Railway and Great Eastern cars would not load so many people as given in the table if passengers hunted for seats, but the figures for unloading would, of course, be as shown. The capacity of a number of the types with cross seats could obviously be increased by using a widened construction like that in Fig. 24.

Through limited service has been instituted between Columbus and Dayton over the Appleyard lines. The running time is three hours, about one hour faster than the local schedule.

STATION STOPS IN RAPID TRANSIT SERVICE

The Street Railway Journal has been interested for some time in some of the question raised in the article on "Car Design and Carrying Capacity," printed elsewhere in this issue, but especially in the effect of car design on station stops, a matter which has received less attention in the past than acceleration, speed and braking. While these last are most important factors in rapid transit, station stops must be short if they are frequent and if a high schedule speed is needed. According to L. B. Stillwell, in an address on the New York Subway on Feb. 8 at the annual dinner of the American Institute of Electrical Engineers, the factor of time lost at stations presents the most serious obstacle to the satisfactory solution of rapid transit problems. An interesting contribution to the subject has been furnished to the Street Railway Journal by James R. Chapman, general manager of the Underground Electric Railways Company of London. He states that practically all the suburban business of the steam railways entering London is handled in side door cars, and similar equipment is being added every year. The cars used on the London electric tube lines, however, are of the American type with end doors. The diameter of the tubes being 11 ft. 6 ins., the floor of the car cannot be raised high enough to permit of a side door. Hence the advantages and disadvantages of both types of cars for handling short riders can easily be studied in London.

The side door car has the following advantages:

Greatest possible seating capacity per lineal foot of train.

Rapid loading and unloading of passengers at terminals.

Minimum number of trainmen.

Its disadvantages are as follows:

Time lost at intermediate stations.

Difficulty in properly lighting, warming and ventilating.

Danger to passengers from evilly-disposed persons.

Risk of passengers falling out of car in motion.

Impossibility of collecting fares between stations.

Non-resistance to telescoping due to inherently weak construction above floor line.

In regard to time lost at stations, an excellent illustration is between Notting Hill Gate and the Bank. The Central London Railway, a tube line, has a station on one side of the street at the former point, and the Metropolitan Railway has its station on the opposite side of the street. The tube line has ten stations in 4.7 miles, and its stops average eighteen seconds per station with end door cars. The Metropolitan Railway, for the same number of stops, averages thirty-seven seconds per station with side door cars. The figures given represent the mean of many observations during the busy hours. The character of traffic is the same, both lines receiving more passengers than they discharge for the first five stations, and discharging more than they receive for the remainder.

On the other hand, the side door train of nine short cars has but two trainmen, while the end door train has a man between each pair of cars, or six men for seven cars. The side door trainmen have plenty of work shutting doors at every station. In this duty they are assisted by one or more station porters. It is not unusual for a train to start with fully one-half of the doors open, and these are caught and slammed as it moves off, the operation being rather trying to the nerves of the passengers. Rapid acceleration is not possible under such conditions.

From an American standpoint, the chief objection to side door cars arises from the methods which have to be adopted to collect fares. Many of the suburban express trains make fine runs at the rate of 45 m.p.h. to 50 m.p.h. into London, but wait from two to four minutes at some station, a mile or more from the terminus, while a gang of ticket collectors open the side doors and take up tickets. It is not unusual to see a train with 600 passengers held an extra minute while a few pennies are collected from a passenger who has lost his ticket. A receipt is given for the amount collected, and 599 passengers lose a minute and get no receipt.

On other lines the train is brought directly into the terminus and passengers are passed through a gate. Each one is expected to say "season," or give the gateman a piece of colored cardboard. The pressure from behind is severe, the gateman does a two-handed business and takes anything that is given to him. The whole system is very crude and wide open to fraud. If a fraud is discovered, however, an English magistrate has to be reckoned with, and the fine is heavy; while in America the police magistrate would probably discharge the offender and assess the costs against the company for not having a better system.

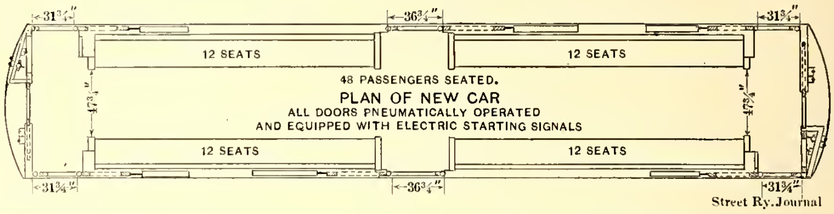
While Mr. Chapman's company, in building the new Metropolitan District Railway cars, has abandoned the swinging door compartment type for a sliding end and middle door type along Boston Elevated lines, the Illinois Central Company has been developing its side door steam car and obtaining remarkable results with its use. This type of car was so fully described and illustrated in the Street Railway Journal for April 30, 1904, page 661, and July 4, 1903, page 21, that it seems hardly necessary to repeat more than to say that, with a length over all of 72 ft., there are 100 cross seats, facing each other, with twelve sliding doors on each side of the car opposite each section of eight seats, the seats being arranged down the middle of the car, with an aisle on each side. The side doors are operated from the ends of the car, and can be all opened or closed at once, or locked or unlocked, the general practice being at way stations to merely unlock all doors and allow passengers to open such as they wish to use, all being then closed by the guard. In regard to the length of stops, the originator of the car, A. W. Sullivan, states that no formal test has been made to determine how rapidly the cars might be worked, the results in ordinary service being so remarkably good that no special test has been deemed necessary. As an illustration, he gives a statement of the time required for station stops on a run recently made, leaving Randolph Street at 4:35 p. m., with a heavy load of passengers, the time being taken with a stop watch and the test made without the knowledge of the trainmen, who on this trip were performing their duties in the usual manner:

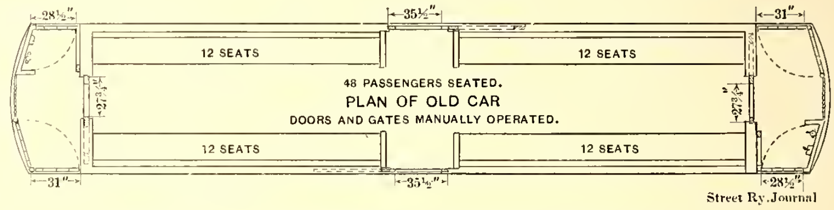
Stations.	Time consumed in stops.
Sixteenth Street	7 seconds.
Twenty-Second Street	5 "
Twenty-Sixth Street	6 "
Thirty-First Street	8 "
Thirty-Sixth Street	12 "
Thirty-Ninth Street	7 "
Forty-Third Street	9 "
Forty-Seventh Street	12 "
Fiftieth Street	9 "
Fifty-Third Street	10 "
Fifty-Seventh Street	6 "
Sixtieth Street	5 "
Sixty-Third Street	3 "

The average time of the thirteen stops was 7.61 seconds. Considering that the passengers on this train were largely ladies returning from their day's shopping and that their movements were made with much deliberation, the time required to make the stops, to open the side doors of the cars, let out and admit passengers, close the doors and lock them, is quite remarkable. There was in this case no opportunity for the trainmen to cut short their work by giving the signal before all the passengers were on or off, as all the doors were on an electric circuit, and the only manner in which the signal can be given to the engineer to start the train is by actually closing the doors. So the operations were conducted under conditions that admit of no possible chance for casualties by persons attempting to get on or off trains while in motion.

In regard to the heating of the Illinois Central type of car, some doubt having been expressed as to the possibility of keeping a side door car warm in American winter weather, it is interesting to know that the Illinois Central Company has found its new type easier to heat than its other cars, the exhaust steam from the air pump on the locomotive being all that is required. The explanation given for this ease in heating is that the heating coils under the seats are so exposed as to allow the favorable circulation of air about them, so necessary for efficient heating. Cold air entering a side door, passing along the floor as it does, quickly meets obstructions, loses its velocity, and is soon heated in contact with the steam pipes under the seats, the car design allowing a large amount of radiating surface. With an end door car, cold air finds a long aisle to sweep down, and the heating surfaces seem less easily reached, though, of course, end doors are more sheltered than side doors. When all the side doors of a train are opened, more cold air can enter than by two end doors; but in practice on the Illinois Central, only a few doors are opened at each station, except at the terminals.

The Boston Elevated Company has been operating for some time two types of cars as illustrated in the accompanying diagrams, the older cars having open platforms, end doors, swinging gates, with middle side doors opened by platform men, all day long on the first car of each train, and on all cars at terminals and during the rush hours. The newer cars have no platforms, but sliding end and side doors, operated by compressed air from the car ends by the guards, as illustrated in the STREET RAILWAY JOURNAL for Aug. 6, 1904, page 202. One of the new trains has had its middle doors equipped with pneumatic operating apparatus, and also an electric signal, by which a starting bell is rung in the motorman's cab the instant every door is safely closed. A test was made on Jan. 19 to determine how quickly this last new train could handle passengers compared with an old train. The old train followed the new over the same routes, covering the entire system. The old train had the end gates of all cars and the side door of the forward car opened at all stations all day. In addition to this, during the rush hours all the doors in the old train were opened at all stations except on Atlantic Avenue and Northampton Street, northbound, and Thompson Square and City Square, southbound. The new train had all doors opened at all stations all day, the doors being operated by pneumatic means. At the terminals all doors and gates of all trains were opened at all times of the day, except the forward and rear end doors of the trains, which are never opened. The number of passengers getting on and off at each station were counted and the length





PLANS OF OLD AND NEW BOSTON ELEVATED CARS

TABLE I.—SHOWING STOPS AT ALL INTERMEDIATE STATIONS ON BOSTON ELEVATED

STATIONS.	Schedule Station Stops in Seconds Average.	OLD TRAIN. Station Stops Secs. Total.	OLD TRAIN. Station Stops Secs. Average.	OLD TRAIN. Passengers On and Off. Total.	OLD TRAIN. Passengers On and Off. Average.	OLD TRAIN. Passengers On and Off. Per Sec.	NEW TRAIN. Station Stops Secs. Total.	NEW TRAIN. Station Stops Secs. Average.	NEW TRAIN. Passengers On and Off. Total.	NEW TRAIN. Passengers On and Off. Average.	NEW TRAIN. Passengers On and Off. Per Sec.	Per Cent Passengers Per Sec. Old Train=100.
Thompson Square	13.0	208	13.0	158	9.9	0.76	208	13.0	213	13.3	1.02	134
City Square	15.5	255	15.9	275	17.2	1.08	232	14.5	263	16.4	1.13	105
North Station	24.5	283	25.9	360	32.7	1.26	194	17.9	376	34.2	1.91	151
Haymarket Square	17.	208	19.1	296	26.9	1.41	175	16.0	285	25.9	1.62	115
Adams Square	16.	96	19.2	163	32.6	1.70	87	17.4	166	33.2	1.91	112
Scollay Square	26.5	377	34.3	992	90.1	2.62	320	29.0	1,020	92.9	3.20	122
Park Street	30.	366	33.3	972	88.3	2.65	314	28.5	875	79.5	2.78	105
Boylston Street	20.5	298	27.1	705	64.0	2.36	245	22.5	682	61.9	2.75	116
Pleasant Street	17.	216	19.7	324	29.4	1.49	164	14.9	288	26.2	1.76	118
Dover Street	17.	140	23.3	297	49.5	2.12	107	17.8	283	47.2	2.63	124
Northampton Street	18.	134	22.3	187	31.2	1.40	112	18.7	186	31.0	1.66	119
Battery Street	18.	82	16.4	68	13.6	0.83	68	13.6	76	15.2	1.10	133
State Street	13.	85	17.0	80	16.0	0.94	64	12.8	66	13.2	1.03	110
Rowes Wharf	19.	66	13.2	73	14.6	1.11	55	11.0	63	12.6	1.14	103
South Station	23.	99	19.8	139	27.8	1.40	100	20.0	209	41.8	2.09	149
Beach Street	14.5	57	11.4	38	7.6	0.67	58	11.6	43	8.6	0.74	110
TOTALS	....	2,970	....	5,127	....	....	2,503	....	5,094	....	....	....
AVERAGES	18.9	....	21.2	....	....	1.73	....	17.9	....	....	2.04	118

TABLE II.—SHOWING ESTIMATED STOPS AT TERMINAL STATIONS

TERMINAL STATION.	OLD TRAIN. Seconds Stop. Total.	OLD TRAIN. Seconds Stop. Average.	OLD TRAIN. Total Passengers.	OLD TRAIN. Passengers Per Second.	NEW TRAIN. Seconds Stop. Total.	NEW TRAIN. Seconds Stop. Average.	NEW TRAIN. Total Passengers.	NEW TRAIN. Passengers Per Second.
Sullivan Square	374	47	1,893	5.06	326	41	1,751	5.38
Dudley Street	180	60	1,002	5.56	160	53	917	5.72
AVERAGES	....	..	....	5.31	....	..	....	5.55
PER CENT. PASSENGERS PER SEC. OLD TRAIN=100	....	..	....	100	....	..	....	105

of stops was taken, so that the number of passengers handled per second was found. Six runs were made, covering both slack and rush hours, with an old three-car train and a new three-car train. Five corresponding runs were made with a four-car train of each type. The accompanying tables give the principal results secured as an average of both the three and four-car trains.

As all trains are held at the terminals for the proper time to start, the figures given for terminal stops are the estimated, not the actual, times taken. For the same reason also they are not of so much importance as the intermediate station records. It will be seen that in these stops the new train beat the old in

TABLE III.—SHOWING SLACK AND RUSH-HOUR STOPS

All Stations Except Terminals.	Old Train.		New Train.	
	Slack Hours.	Rush Hours.	Slack Hours.	Rush Hours.
Average Passengers per Second.	1.25	2.49	1.54	2.65
Percentages	100	100	123	107

passengers per second by from 5 per cent to 51 per cent, the average being 18 per cent. It will also be seen that at Scollay Square, which has the heaviest traffic of all the way stations, the new train showed an average of 3.2 passengers on and off per second with 1020 passengers, as against the old train record of 2.62 with 992 passengers. This is due, of course, to the opening of the middle door by compressed air at all times, to the use of an automatic signal, and to the freer end entrances with sliding doors instead of gates.

The question will be asked whether it has proved safe to operate middle doors from the ends of cars by pneumatic means, and the experience with the Boston Elevated train allows an emphatic affirmative answer. The new Boston doors have proved remarkably safe, due mostly, perhaps, to the pneumatic striker on the edge of the door, which can only press lightly against the smooth door jamb, and cannot hold anyone's clothing or hand.

The conditions in the New York Subway differ from those on most other rapid transit lines, because four tracks are used, and to gain time passengers frequently transfer from local to express trains, and vice versa, at the island platforms. For this reason the number of passengers entering and leaving each train is much larger than if each passenger used one train only. A fair average of the length of station stops on the subway is given in the accompanying table:

TABLE IV.—AVERAGE LENGTH IN SECONDS OF STATION STOPS ON NEW YORK SUBWAY

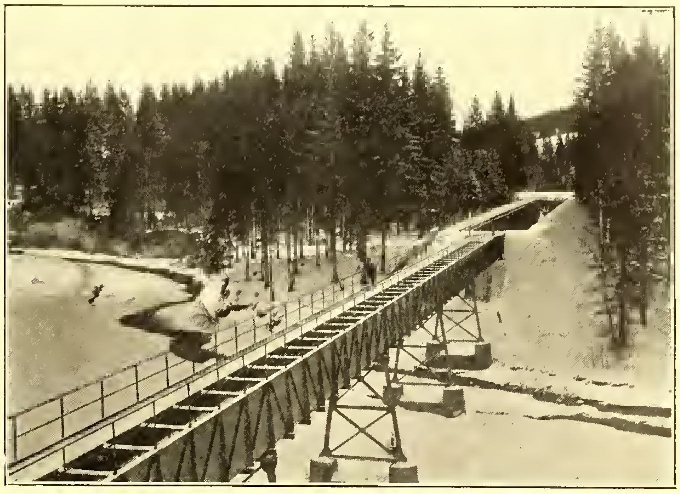
Type of train	Slack hours	Rush hours Important stations
Subway express five-car train	30	....
Subway express eight-car train	35	50-70
Subway local	12-15	25-30

In the average one-minute stop for the express trains at important stations during rush hours, about twenty seconds are taken by passengers leaving the train, about thirty seconds by passengers boarding the train, and about ten seconds in getting started. These figures are unofficial, but are the average of a number of observations, the length of time varying with the number of passengers getting on and off the train. The average length of station stops on the New York elevated lines is about the same as that on the subway local trains.

President A. G. Wheeler, of the Illinois Tunnel Company, estimates that the company will carry 3,000,000 tons of dirt during the remainder of the present year. The charge for hauling is 62½ cents per cubic yard.. By the use of the tunnels the foundations for the new buildings to be constructed for the Northern Trust Company and for Marshall Field & Company are being put in without disturbing the present tenants of the properties.

MURNAU-OBER-AMMERGAU SINGLE-PHASE RAILWAY

Murnau is a station on the Partenkirchen branch of the Bavarian State Railways, one of the several small lines that run from Munich into the picturesque mountainous country on the border of Tyrol, known as the Bavarian Highlands. Ober-Ammergau is right in the heart of these mountains, and has



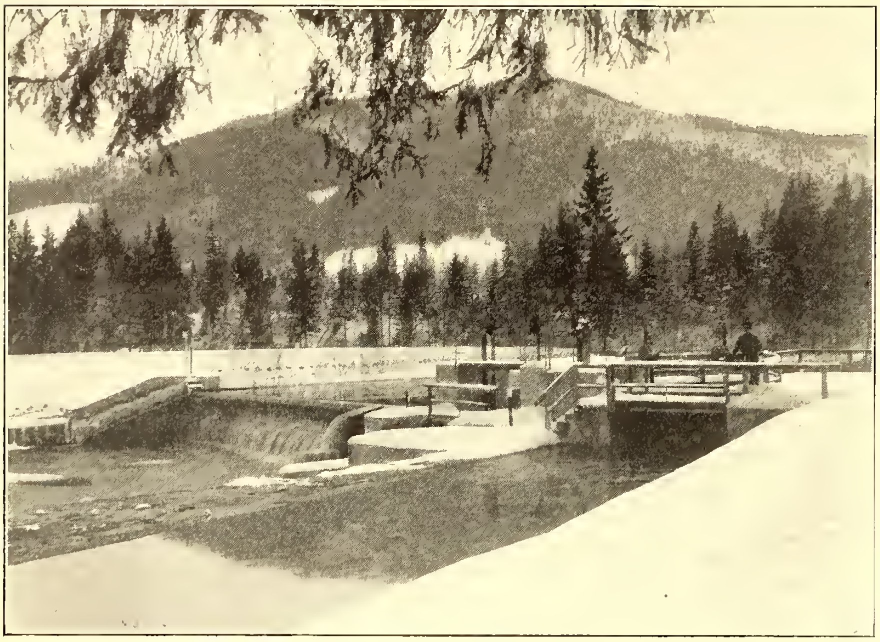
MILL RACE CROSSING THE RIVER AMMER BELOW INTAKE, BY MEANS OF STEEL AQUEDUCT

become famous owing to its association with the decennial passion play that takes its name. The new railway will now be able to develop the already considerable traffic between the mountains and Munich, of regular tourists, holiday makers, peasants, hunters, etc., as well as a good business in farm

VIEW NEAR RAILWAY STATION, SHOWING ORDINARY TYPE OF SUSPENSION

produce. The rolling stock, as will afterward be shown, has been built specially to meet these requirements.

The line, which is 23 km long (about 14 miles), is operated on the Siemens-Schuckert single-phase current traction system. The power is derived from the River Ammer, a stream which rises in the Ober-Ammergau Mountains, and running through the Ammerthal discharges into the Ammersee. The line starting from Murnau more or less follows the coach road running west and skirting the Staffelsee, thence through Kohlgrub, it joins the Ammerthal and turns south, passing Saulgrub, Wurmesau and Unter-Ammergau to Ober-Ammergau. The power station is situated about 8 km from Ober-Ammergau (i. e., the line is fed at a point one-third its length from one end). One of the views shows the dam and intake at the commencement of the mill race. The latter crosses the stream some distance below the intake by means of a steel aqueduct, and a considerable head is available. The power station is provided with two turbines, each of which is direct coupled through a flexible coupling to two generators arranged in tandem on the same shaft. The generators nearest the turbines are single-phase machines, and the others generate three-phase current, which is used for lighting some of the neighboring villages. The single-phase current is generated at 5000 volts and at a frequency of 16⅔ cycles per second, and is fed direct into the line at this pressure, the return being to earth. The total drop in volts when two trains are at the end of the line furthest from the power station is only 6 per cent.

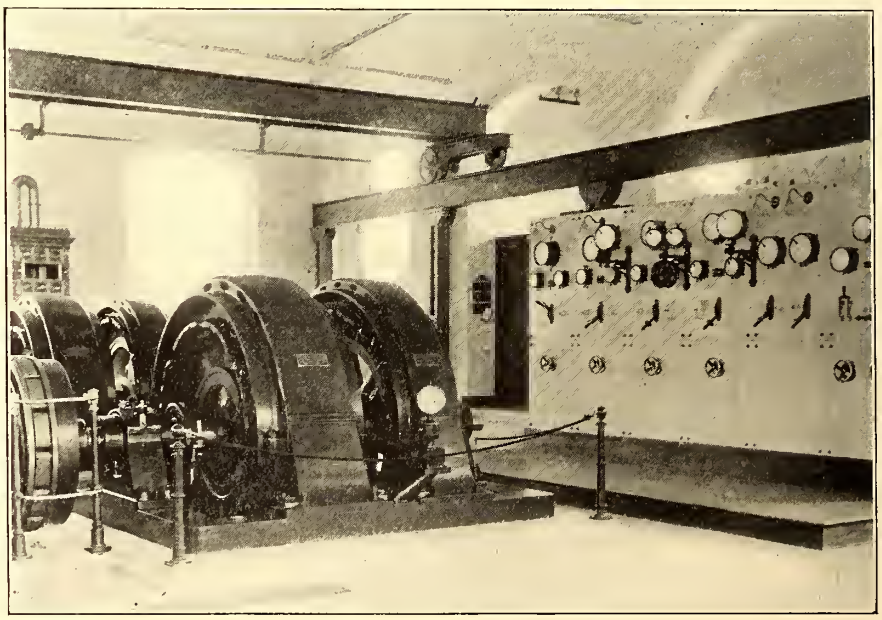


INTAKE OF THE MILL RACE

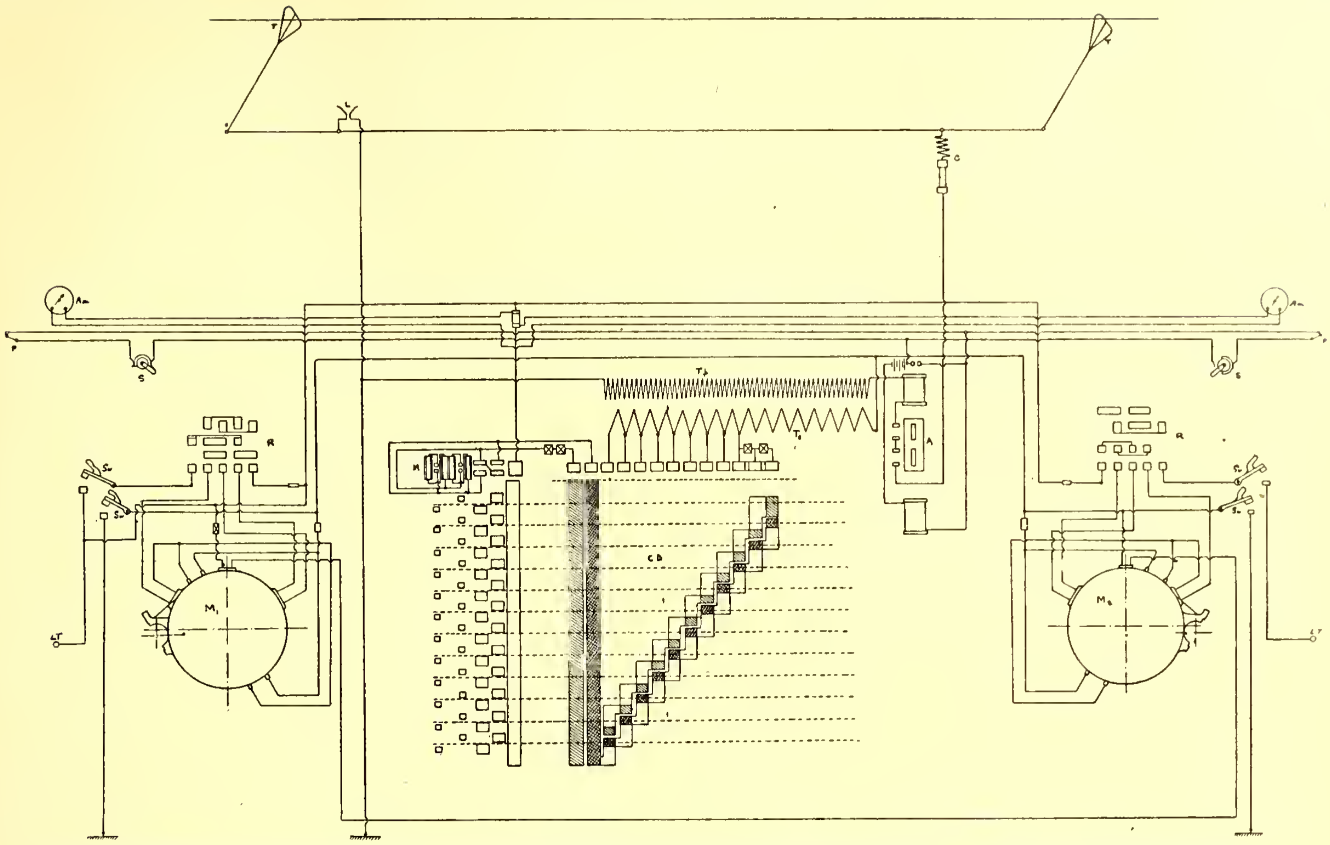
The overhead wire is mostly single, but there are some experimental lengths of catenary suspension, comprising one steel catenary and two copper wires. The second illustration shows a station with ordinary single suspension and one of the poles provided with horn type lightning arresters, which carry out their functions very well. The district is subjected to extremes of weather, the violent thunder storms of the summer giving place to heavy snow storms and intense cold in the winter, when the temperature falls as low as —30 degs. C. Hence, the overhead line has had to be very carefully and strongly erected. It was at first found that the snow tended to short-circuit the lightning arresters, while the lubricants of the motors and car axles often froze, but these troubles have been successfully overcome.

The cars are of the corridor type. The trailers are ordinary four-wheel coaches for third-class only, and are attached to the motor coaches as required. The latter are mounted on three axles and are divided into four sections, namely, second-class, third-class, post and luggage, and driver's compartments. Their net weight fully equipped is 26 tons. They are well lighted by means of batteries under the car bodies and electrically heated by radiators in the secondary circuit. The brakes are worked by compressed air provided by axle-driven compressors.

The collecting apparatus comprises two bows mounted on the top of each car on frames which are insulated from the roof. The bows are held up by springs and are pulled into position by an air cylinder which is fed from the brake reservoir and controlled by the driver. The high-tension current is taken past a horn lightning arrester through a choking coil and fuse on the roof, and passes thence to an automatic circuit breaker (see diagram) under the car body. This switch is mechanically closed by the first operation of the controller *CB*, which is provided with two electromagnetic trip devices; one of these is in series with the primary of the transformer *Tp*, and operates as a maximum cut-out; the other trip device is controlled by a local battery and switch in the driver's cab, and enables the driver to open the main high-tension switch. Each motor is provided with one transformer, which is suspended under the car body, enclosed in an oil tank, which is ribbed outside. The secondary coil of the transformer *Ts* is connected at various points to the controller *CB*, which is provided with a magnetic blow-out *M*, and is taken thence to the reversing switches *RR* and the motors *M1* and *M2*, the main current passing through an ammeter shunt to which are connected two ammeters *Am*. The reversing switches have, as will be seen, three positions. The two extreme positions are for backward and forward running, respectively, while the center position is for taking the cars into the car shed, where a special low-tension overhead trolley line is provided. For this purpose, when the cars arrive at this point the switches *Sw* are closed and the low-tension trolleys *LT* are put into operation. The transformer reduces from 5000 volts to 260 volts, and the barrel controller switches this voltage step by step on to the motors.



VIEW OF POWER STATION, SHOWING GENERATORS AND SWITCHBOARD



ARRANGEMENT OF WIRING CIRCUITS ON CARS FOR THE MURNAU-OBER-AMMERGAU SINGLE-PHASE RAILWAY

Each car is provided with two 80-hp motors, which are geared to the two end axles of the coach through single reduction gears with a ratio of 1 to 5.2, the running wheels having a diameter of 800 mm (31½ ins.). These motors enable the car to maintain a normal full speed of 40 km per hour when running either by itself or with a trailer. The two motors are always in parallel; they are of the 10-pole single-phase commutator type, and are built to a design which includes special windings for reducing the sparking. It is claimed that this arrangement has been so successful that the sparking at the commutator is practically nil over a very wide range of speed. This type of motor can also be arranged for running with continuous current if necessary. The cars have been tested on the steepest grade (1 in 25), and they started with a gross load of 50 tons without any trouble whatever.

The complete electrical equipment for this railway, which was opened for regular service early this year, was designed and supplied by the Siemens-Schuckert Company. It is reported that this company is also completing for the Swedish State Railways a single-phase locomotive which is capable of working with 20,000 volts taken direct from the trolley wire. They are also at work in conjunction with the Allgemeine Elektricitäts Gesellschaft on the Hamburg-Altona single-phase line. It is interesting to learn that single-phase railway motors of the type above described are being made by Siemens Bros. & Company, Ltd., at their Stafford Works, England.

MOTOR CAR AND TRAILERS STOPPING AT A STATION

WELDED VS. FISHED AND BONDED RAIL-JOINTS

BY WILLIAM H. COLE

The use of thermit in the welding of rail ends, especially in street railways, has become so well known within the past six months that the management of nearly all the systems in operation in the United States know more or less what it is and its advantages. It is obvious that if it is possible to join the rail ends permanently together so that they become continuous, and the joint has been practically eliminated, and permanently so, one of the worst, most expensive and annoying troubles incident to track construction and its maintenance has been overcome.

There can be no doubt that this can be done when thermit has been applied in rail-welding. The rail ends are melted together at their ends and become one solid mass, and the joint no longer exists. It has also been demonstrated in making this weld that the quality of the steel in the rail has not been changed and that no decarbonization takes place. Repeated tests show that the tread of the rail retains its hardness, and at same time the joint may be handled and used just the same as any other part of the rail. The conductivity of the joint is above that of an equal section of the rail away from the joint, and remains so up to the end of the life of the rail.

The simplicity of the application of the system, its flexibility and the fact that it may be economically applied to the welding of worn joints without interruption of traffic, are facts that appeal strongly to the track engineer, but its superiority in another direction, and the enormous economy worked out during the life of the rail, does not seem to have been so fully gone into in the United States by street railway engineers as in Europe and Great Britain. There are many cities in Great Britain and Europe that set aside as high as $2,500 per mile per annum for upkeep of rail-joints, bonds and track.

The following is an estimate made to show the actual economy in welding the rail ends with the Goldschmidt thermit system, as compared with the same line joined with fish-plates and bonded with a 000 copper bond around the same. A case has been taken where a 7-in. steel rail weighing 70 lbs. to the yard was laid on creosoted ties, 2-ft. centers, paved with the usual granite blocks. An average was taken of 500 amps. for twelve hours per day at 500 volts, current delivered at 2 cents per kw-hour:

Cost of fish-plating and bonding 1 mile of double track..	$2,816
Depreciation of joints (life ten years, of rails) at 20 per cent per annum	1,408
Testing for bad bonds	1,260
Paving, repaving, excavation, etc	2,110
Repairs of rail-joints, tightening up bolts, paving excavation and repaving	2,310
	$9,904
Credit for old copper	294
Cost of one mile of double track to the extent of its life, including upkeep*	$9,610

Cost of 1 mile of double track with joints thermit welded at, say, $4.00 per joint	$2,816
Losses by breakage of rails, caused by contraction at ½ per cent per annum (the life of the rail when welded by thermit being estimated at twenty-five years)	353
Total cost of line and upkeep for life of rail (twenty-five years)	$3,169

The comparative cost of ten years' life of thermit welded joints and of fished and bonded joints would then be as follows:

Fished and bonded joints	$9,610
Thermit welded joints for ten years	1,243
Difference in favor of thermit welded joints for 1 mile of double track, 70-lb. rail	$8,367

This gives at the end of the life of the rail, when fished and bonded, a difference of $10.81 per joint, which is more than double the price of making a thermit joint for such a rail.

Again, take the same rail and calculate the loss per mile of double track where joints are fished and bonded with a 000 B. & S. copper bond, and include the loss of life of rail by depreciation of joint, caused by imperfect joining and bonding. The loss of current on account of difference in resistance between bond and rest of line, leaving out considerations of interest, etc., and the fact that the bonds are continually depreciating, would be as follows:

Loss on rails, per annum	$683.00
Loss on bad bonds and renewals, per annum	448.60
Loss on current to overcome difference of resistance of bonds and resistance of rail if thermit welded	181.77
Per annum	$1,313.37
Cost of upkeep of thermit welded joints per annum	124.30
Difference per annum in favor of thermit welds, or the respectable sum of $1.69 per annum per joint	$1,189.07

The above calculations have been made without regard to the wear and tear of rolling stock, pounding over worn joints, and to say nothing about the increased comfort of the patrons of a line where the joints have been welded.

The calculations as to loss of current are based upon the following: 000 B. & S., 36 ins. average length, 500 amps. for twelve hours per day; resistance of bonds, 0.0083 ohms per mile more than if the rails were continuous; 70-lb. steel rail; cost of current, 2 cents per kw-hour. This runs into the respectable sum of $181.77 per annum, and is based upon the assumption that the tracks and lines were regularly cross-bonded and the bonds were kept up to their best condition all of the time. As a matter of fact, 15 per cent or 20 per cent can be safely added to this amount on account of the bonds after a period of a few months. If even 10 per cent is added, it brings the amount up to the large sum of $199.94 as a dead loss per annum for each mile of double track.

There is another phase that must not be lost sight of that is bound to be given some prominence in the near future, and that is earth returns of current and its damaging effect by electrolysis to adjacent pipes. The writer has often seen a drop in voltage on lines of 150 volts, and a good part of this is due to defective bonding. The current must return in some way, and it is natural to suppose that water, gas and other metallic pipes assist materially in return the current. The authorities are bound to take this subject up seriously in time, and it would seem to be good engineering to forestall such a movement by at least giving the rails their full conductive strength, which can be obtained by welding the joint. The English and other European nations have strict laws in force on this question and enforce them to the letter.

The English Board of Trade rules provide for elaborate tests to be made periodically, and will not allow a loss on the negative lines from the furthest point to the power station to exceed 7 volts.

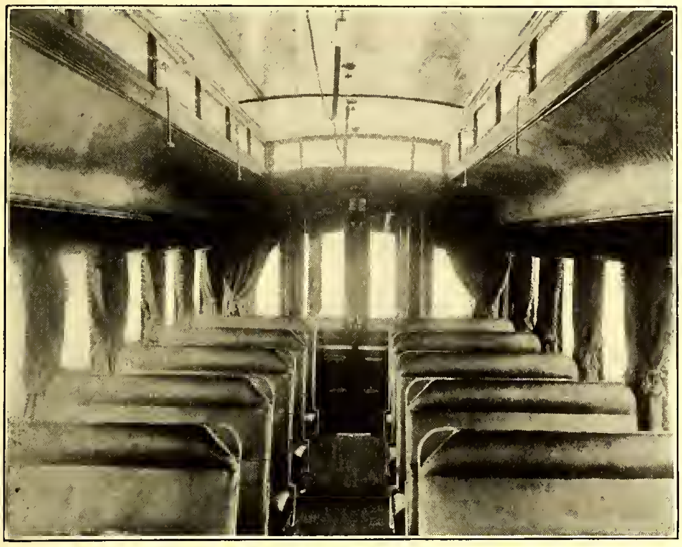
* See article in Street Railway Journal, Sept. 3, 1904, entitled "Rails and Joints."

Henry A. Everett, of the Everett-Moore Syndicate, seldom takes out a party in his private car, "The Josephine," that he does not undertake to reduce previous records. Last week the car made a remarkable run from Cleveland to Detroit over the Lake Shore Electric and Detroit, Monroe & Toledo lines. It left the Public Square in Cleveland at 12:30 and arrived at Toledo at 3:46 p. m. Here there was a slight delay, but the run to the Russell House in Detroit was made by 5:43 p. m. The distance is 178 miles. The Lake Shore (steam) has a train which leaves Cleveland at 12:45 and runs by way of Sandusky and Toledo, reaching Detroit at 4:30. The distance by this route is 171 miles, so that the electric run was two minutes faster over a route 7 miles longer. It is stated that the run was made without interfering in any way with the regular schedule.

FUNERAL CAR AT BUFFALO

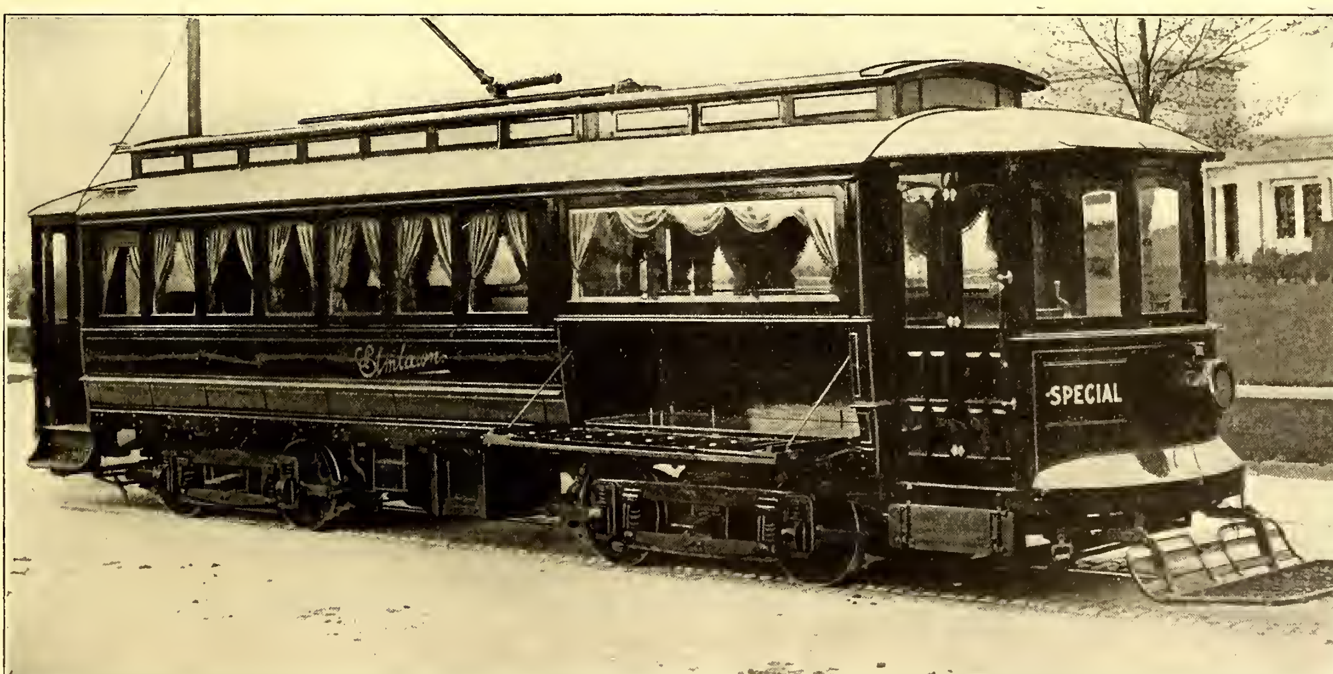
In response to numerous requests from undertakers and the public generally, the International Railway Company, of Buffalo, has put in service a special funeral car for the use of funeral parties desiring to go to cemeteries in the suburbs of Buffalo, Niagara Falls, Lockport and the Tonawandas.

The car was formerly a 28-ft. body passenger car and was rebuilt at the company's shops. It has two compartments, one about 19 ft. long, containing six cross seats and a short longi-



INTERIOR OF LARGE COMPARTMENT OF FUNERAL CAR

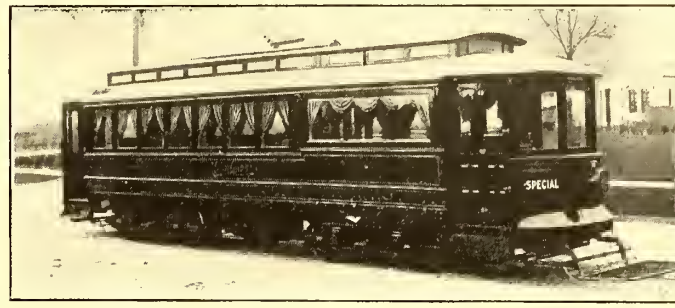
tudinal seat along one side and five cross seats and two short longitudinal seats on the other. The second compartment is about 9 ft. long and is intended for the casket and the pallbearers or immediate family of the deceased. This smaller compartment has a longitudinal seat along one side. The



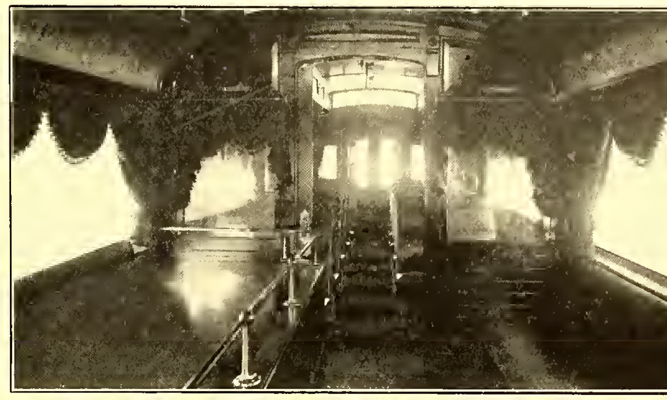
CONVERTED PASSENGER CAR, FITTED FOR FUNERAL SERVICE BY THE INTERNATIONAL TRACTION COMPANY, OF BUFFALO, N. Y., SHOWING ALSO THE CASKET COMPARTMENT OPEN

casket is carried in an enclosed case or compartment extending along the other side.

The casket compartment is about 8½ ft. long, 32 ins. wide, and the top comes about to the level of the window rail. The top of this compartment forms a convenient place for the floral contributions. Access to the casket compartment is had through a door from the outside of the car. The door is hinged at the bottom and is let down much as is the berth in a Pullman



EXTERIOR OF FUNERAL CAR, WITH CASKET COMPARTMENT CLOSED



ARRANGEMENT OF SMALLER COMPARTMENT

sleeper. It is held by chains and spring rollers, similar to those used on Pullman berths.

The casket rests on a sliding floor or shelf. When the casket is to be placed in the car, the door is let down, the sliding shelf is pulled out and the casket is placed on this shelf and firmly secured in place by means of pegs placed along the sides and ends. The pegs go into holes in the shelf, there being several lines of these holes, so that any size of casket can be accommodated. The shelf bearing the casket is then pushed back into the compartment and the door closed and locked.

The exterior and interior of the car is finished in dark green.

with heavy dark green draperies at the windows and doors. The seats are the Hale & Kilburn high-back type, with high roll-back and finished in dark green leather. The car is heated with Consolidated electric heaters.

The car is mounted on Brill 27 trucks, with four GE 1000 motors and Christensen air brakes.

The car is named "Elmlawn," after one of the large suburban cemeteries. A charge of from $25 to $35 is made for the use of the car, depending upon the distance it has to travel. It is engaged for most of the funerals going to the outlying cemeteries, and the greater comfort, privacy and convenience of the funeral car, as compared with horse-drawn coaches, seems to be appreciated by the public.

THE OPERATION OF AUTOMATIC ELECTRIC TRACK SWITCHES

BY SIDNEY DIAMANT

The importance of developing every detail in street railway operation which will assist in the proper maintenance of car service schedules has for a long time been recognized by operating officials. Under conditions of heavy traffic in the streets of our largest cities, a very few delays, even if of slight duration each, are sufficient to entirely disorganize the schedules of an entire division, which will result in a serious loss to the operating company. Studies of operating conditions with the view of eliminating the possibilities of delays are, therefore, of particular interest to large railway companies, and in this connection the use of the automatic track switch has offered many attractions as a means of accomplishing this end.

The need of provisions of this nature are perhaps more keenly felt in the city of New York than anywhere else in this country, although there are unquestionably many other cities where the same problem has grown to troublesome proportions. The inevitable delays at switching points, especially upon lines where in "rush" hours cars are operated upon twenty seconds' headway or less, amount to a very serious matter, and in consequence the New York City Railway Company has for some time been conducting an extensive series of experiments along this line. The results are of interest and, furthermore, are very promising in their relation to future work in this direction. As a positive assurance of operation at the desired moment, an automatic contrivance eclipses any attempt at punctuality which human attendance may offer, and, while its first cost may in some cases appear unreasonably large, the expense for installation of the electric automatic track switch is compensated for by the reduction in future operating outlay. The New York City Company has installed several automatic switches at various points, and is making preparations for the installation of several others in the near future.

Numerous and well-grounded reasons exist which strongly favor the operation of switches by automatic means rather than have a switchman stationed at every switching point for the purpose of manually controlling the switch tongue movement. The continuous expense for manual labor, taken in the aggregate for all the switchmen required upon a large city system, involves an expense item of great size. The presence of switchmen at important switching points involves additional office expenses and detail in time keeping, and also adds to the duties of the inspectors in charge of workmen of that class. When subjected to extreme weather conditions, the switchmen develop inactive tendencies because of physical discomfort, while in event of heavy traffic, the man may find it difficult to reach the switch always at the desired moment, on account of the danger to which he would subject himself, and in the confusion will necessarily cause delays in the operation of cars. Again, the switchman, if careless, may throw a switch only part way over, which will result in serious damage to the equipment by causing the "plow," or underground trolley contact device (as used in New York City), to take one track while the car truck takes the other. When the switch mechanism is operated manually from the street, the hand lever must either remain in position or else be inserted in the bell-crank jaw at each shifting of the switch; the former is undesirable because of obstruction to street traffic, and the latter is a source of delay. Under conditions of manual operation and in the absence of a regular switchman, on the other hand, the motorman from the car must alight and operate the hand lever, which obviously infringes on the schedule.

An automatic switch operating contrivance enables the motorman to operate the switch from the platform of the car while it is in motion, and entirely without outside assistance. Several designs of automatic track switches have been devised, embracing operation by both mechanical and electrical means. Both types have their merits, but the mechanical species have in general offered less promise of reliability under the unusually severe conditions of operation to which such a device will be subjected. The New York City Railway Company has accordingly devoted its attention to the electric type of switch,

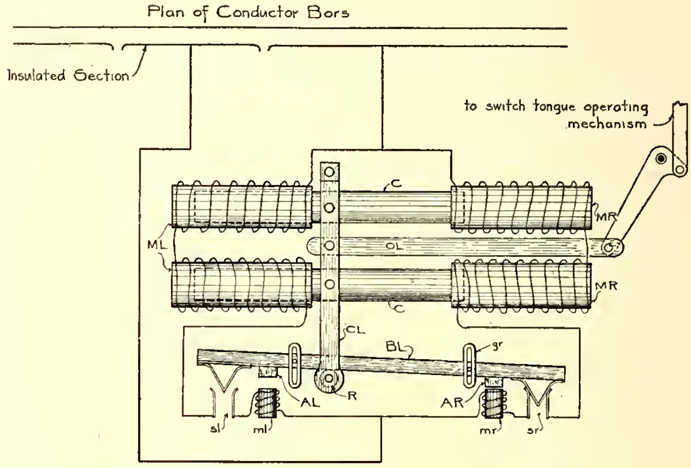


FIG. 1.—WIRING SCHEME BETWEEN TROLLEY CONDUCTOR BARS AND SWITCH MAGNETS FOR THE OPERATION OF THE TRACK SWITCH

and has in use several installations of two different manufacturers of the latter class. One of these was built by the Baldwin & Rowland Switch & Signal Company, New Haven, Conn., and the other by the American Automatic Switch Company, New York.

The American switch was described in these columns in the issue of Dec. 19, 1903. A diagrammatic view of the Baldwin & Rowland switch is shown in Fig. 1. As will be noted, it embraces two electric circuits in parallel, one of the common leads connecting to the insulated section and the other to the live underground conductor or trolley bar on the same side as the insulated section. In each of the parallel circuits are two operating solenoids *MR* and *ML*, a bridge switch *sr* and *sl* and a steadying magnet *mr* and *ml*. When a car is passing over the insulated section with power on, the cores *CC*, which are joined by a yoke attached to the operating link *OL*, are attracted toward the operating magnets *MR*. The operating link is connected to a bell crank which operates the switch tongue mechanism, as indicated. The lower end of the connecting link carries the roller *R*, which, as the plungers move, rolls along the under side of the balance lever *BL*. The position of the balance lever, the unstable setting of which is maintained by the attraction between the magnet *mr* and its armature *AR*, controls the distribution of current to one of the parallel circuits. Only after the plow has left the insulated section does the longer arm of the balance lever descend. The next car passing over the section with power on would throw the switch tongue back to its former position. The function of the magnets *mr* and *ml* is to maintain current in only one of the parallel circuits, and thus prevent to and fro motion of the tongue while the plow is on the insulated section; in the absence of these magnets, just whether or not the final position of the switch would be the one desired for the car schedule, would depend upon the particular part of the insulated section the plow was when the car stopped, and also upon the rapidity of operation of the switch tongue mechanism.

Fig. 2 shows diagrammatically the standard application of the American switch for the operation of switch movements upon the lines of the New York City Railway Company. Additional consideration is involved in the operation of switches upon the lines of this company, on account of the use of the underground contact system of electric operation, as the switching mechanism must throw the slot guide for the "contact plow" as well as the switch point, in order that the plow will be directed to the proper track slot in switching.

The application of the electric switch mechanism for accomplishing this result is here illustrated. The electric switch operates through a system of levers in conjunction with an auxiliary mechanism by which the switching can be accomplished from a bar inserted through a street plate at one side, as shown. A spring-operated retaining or locking leverage is provided on the end of the electric switch rod, by which the system is partially locked in either position of throw; this, in connection with the semi-locking action of the electric switch, makes the switching action very effective. As may be noted, the various levers of the switching mechanism are provided with adjustments by which their throw may be changed to accommodate changes in track alignment.

The switch mechanism is, as may be noted, enclosed in a water-tight case, which is filled with oil for the lubrication of the moving parts within, and which also provides immunity from interruptions due to dirt and other extraneous causes. The magnet coil is also enclosed in a water-tight case, which is filled with transformer oil, thus protecting the magnet from moisture. The wires leading into the magnet coil are introduced through stuffing boxes.

The details of the American switch mechanism have, as above stated, been previously mentioned in these columns. As will be remembered from the same, the action of this switch is positive, causing a complete throw each time the current is passed through the solenoid coil; in this way splitting of the switch tongue and derailment of the car is impossible. The action of the mechanism is such as to partially lock in either position of the switch tongue movement, although the lock is not sufficiently tight to prevent the switch movement being thrown by means of the usual street switch lever.

Fig. 3 illustrates in plan a section of track at a switching point, and illustrates the operating method which has been adopted by the New York City Railway Company as the simplest method of instructing motormen in the operation of the electric type of automatic switch. As indicated in this plan, there is located about 45 ft. in advance of the switch tongue an insulated section in one of the conductor bars of the underground trolley system, which section provides for the operation of the automatic switch, as above explained. In order to indicate the location of this section, as well as to serve as a guide for the various movements in the switching operation, whitewash marks are maintained on the surface of the pavement, which furnish the motormen the information as indicated on the plan.

As will be noted, a V-shaped mark indicates the approach to the insulated section; the wide mark extending entirely across the track further on, indicates the position for the first stop, where the front platform of the car must be brought to a stop when it is desired to change the position of the switch point. Upon then starting the car, a narrow mark extending entirely across the track indicates the position for the motorman to shut off power in passing the gap in the conductor bar (to avoid excessive arcing), while a similar mark extended half-way across the track shows the position for resuming the power after passing the insulating break. The further wide whitewash mark immediately before reaching the switch tongue indicates the position in which the car should make its stop before taking the switch when it is noticed in approaching the insulated section that the switch point is properly placed for the destination of the car, this latter movement providing that the car shall drift across the insulated section without power, in order not to operate the switch mechanism.

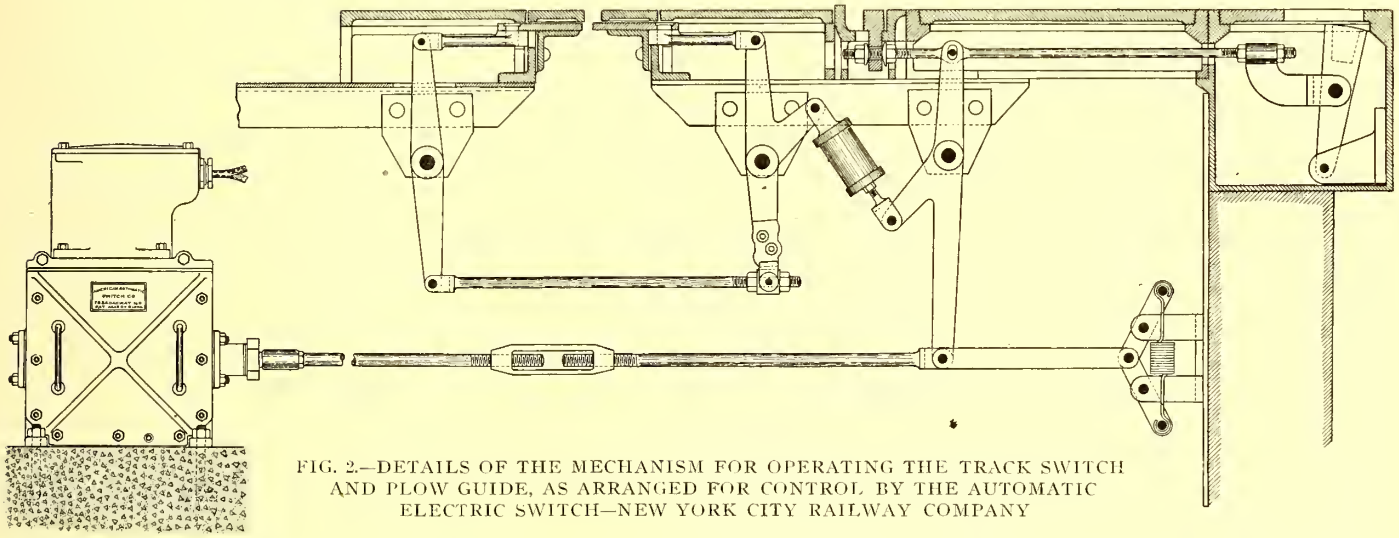


FIG. 2.—DETAILS OF THE MECHANISM FOR OPERATING THE TRACK SWITCH AND PLOW GUIDE, AS ARRANGED FOR CONTROL BY THE AUTOMATIC ELECTRIC SWITCH—NEW YORK CITY RAILWAY COMPANY

To study the modus operandi, let it be assumed that the switch tongue is set for the straight track, and that a motorman, advancing in the direction shown, desires to turn to the left. Upon coming to the electric switch warning mark, he turns off the power and allows the car to drift. Seeing that the switch is set contrary to his route, he brings his car to a stop when the front bumper is over the first stop mark, in which position the plow of the car is on the insulated section marked *I.S.*, and which is in series with the switch solenoid. The car is then started with the controller handle at the first or second notch, which passes a comparatively small current through the operating coil and throws the tongue. When the front bumper reaches a position over the "off" mark, the motorman turns the power off, in order to prevent an arc at the insulating break, and when the "on" mark is reached, the power is again turned on, as by that time the plow has come again in contact with the live section of the conductor bar.

If, on the other hand, the motorman finds the switch point set properly for the route of his car, he is instructed to approach the insulated section at a speed sufficient to drift over the entire gap without power. This prevents current from passing through the switch solenoid coil, and thus the switch point is not disturbed. His procedure in this case is, upon approaching the V-shaped warning mark at a fair speed, to shut off power and drift entirely over the insulated section to the second stop position, after which he may continue upon his trip.

Special instructions are given the motorman concerning the operation of the switches in case of double-throw of the switch mechanism due to being required to stop and start a second time on the insulated section, due to congested street traffic or any other cause, which will result in returning the switch point to the position in which it was found originally. In this event, he is required to throw his controller handle back to zero and

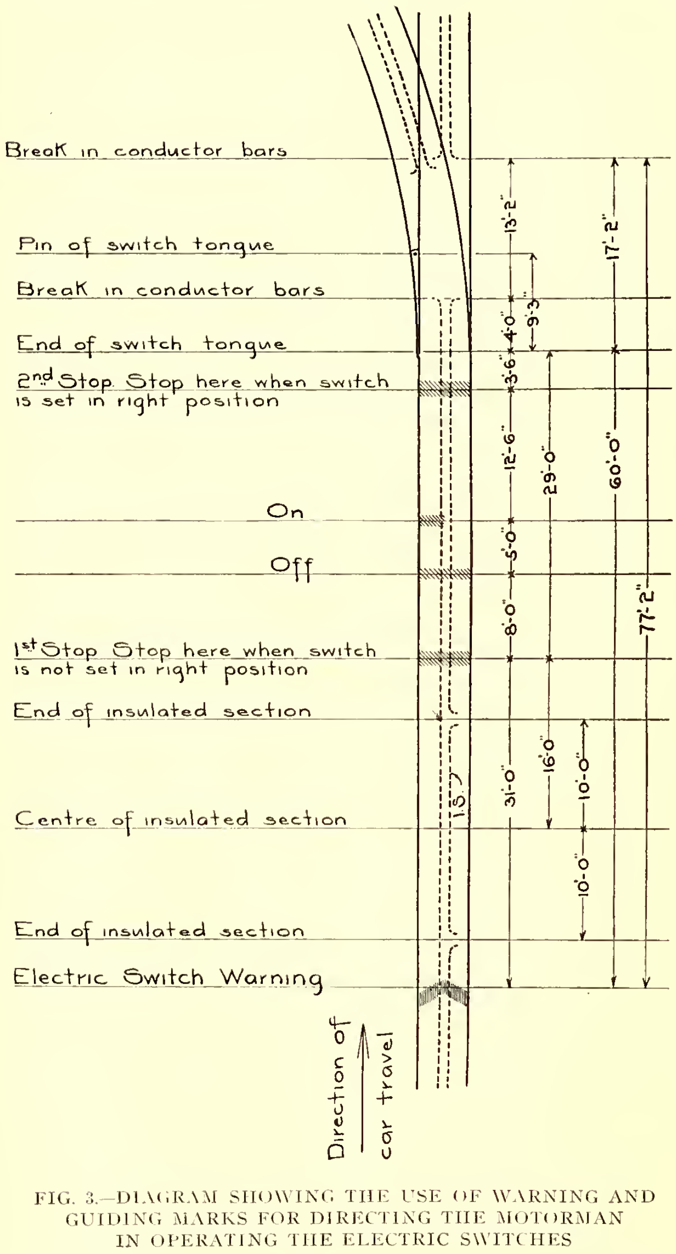


FIG. 3.—DIAGRAM SHOWING THE USE OF WARNING AND GUIDING MARKS FOR DIRECTING THE MOTORMAN IN OPERATING THE ELECTRIC SWITCHES

again turn on power the third time while on the insulated section, which will bring the switch point to the desired position. The motorman must in such a case, however, take precautions not to stop on the insulating break, which would prevent starting, and thus cause serious delay to the car until pushed over by the car following. This is a practical feature of the operation which will be readily apparent, the possibility for which trouble being due to the extremely congested conditions of vehicular traffic in New York City.

Among the advantages of both types of electric switches is the ease of access to all parts, which permits of ready inspection, their convenience of operation and quickness in action. The American type of switch has been under trial for over two years, and now is in use in different sections of the city, and several more are at present being installed. Among its advantages determined during this time the following may be cited: There are no wearing surfaces in the mechanism whatever to change the action, while the enclosure underground in a water-tight metal box prevents the contact of dirt or water with the magnet or other parts. One magnet moves the switch tongue in either of the two directions; the cam plate is arranged to produce a partial lock upon the switch bar, but still does not render the switch inoperative by the hand lever in event of trouble to the automatic mechanism. The switch operates in all weathers.

The automatic switches which are to be installed upon the lines of the company during the coming spring will be placed in locations where street traffic congestion will be most likely to interfere with the operation of the cars; in this way a very thorough trial of the device may be made before extending its use more generally throughout the city. This does not involve any question of the advisability as to the use of the automatic switch, as its advantages far overweigh any objections to its use. The financial advantages of the introduction of these switches are very considerable, as in each case they will obviate the necessity of two switchmen, one for day and the other for night service. As these switchmen are paid approximately $2 per day, this means a saving of $4 per day, or $1,460 per year (365 days), which at an interest rate of 6 per cent would warrant an expenditure of over $20,000, neglecting attendance and repairs to the automatic switch. There are upward of 140 switching points upon the lines in New York City, so that an idea may be had of the possibilities in this direction. If 100 switches are installed the annual saving will thus grow to $146,000—an amount worthy of consideration.

CREATING TRAFFIC—IV. WHAT AND WHEN TO ADVERTISE

BY E. P. HULSE

In the previous three issues the writer has considered the newspapers, bill-posters and other channels of publicity for making public announcements, but of equal or greater importance is to determine what to advertise through them. As to the pleasure travel, there are many things all ready to handle on the system, such as historic spots, recreation grounds and public events of one kind and another. But the best traffic man is the one that causes public events to grow where none existed before—in other words, to originate new reasons for crowds gathering at points where his road will get the benefit. On the principle that the nimble sixpence makes the shilling, he should remember that the short haul boosts up the earnings per car-mile. A study of his parks, picnic grounds, historic spots, suburban routes, swiftest schedules will develop how best to advertise these regular features, and the public events that occur by the calendar or that can be foreseen can easily have sufficient publicity given them.

Some of the events that can be "created" are city days at your various resorts, music festivals, electric carnivals, family reunions, gatherings of all orders and societies, special outings on the holidays of the various nationalities in your territory, political conventions, labor meetings for all sorts of purposes, water fetes, children's days, horse races, band competitions on a large scale, clay and live pigeon shoots, firemen's play-outs, old-timers' reunions, sham battles, and so on without end. Plan them well beforehand, get influential individuals interested, work them up, nurse them along and aid them, but seldom "stand" for them. "Under the auspices of" be your watchword! The nickel, not the glory—amen!

City days at some resort could include band concerts, ball games by rival local nines, clay pigeon shoot, mammoth tug-of-war, hurdle and obstacle races and field sports. Get the most prominent citizens to act as judges, have the prizes donated by local firms and displayed in their windows and work on civic pride for your publicity. Music festivals might include all the musical societies of a State, if no State organization already exists through which it could be worked. There should be a score of State soloists, vocal and instrumental, an immense festival chorus, a few singers of perhaps national reputation and a symphony orchestra. Plan it for several days, where the company is interested in a hotel, if possible—and let the public know about it. Many of these great events are pulled off in apparent secrecy. Electric carnivals in parks and picnic grounds at night are based principally on some extra current, strings of incandescents and perhaps several gross of Chinese lanterns. One or two spectacular attractions to focus attention on beforehand and for the crowds to talk about afterward, in addition to the regular amusement features of the resort, and the natural gayety of the people under these circumstances will fill out the carnival. Family reunions work themselves. A few hours with the directories of the cities along the line or in interviewing some of the old inhabitants and you can learn the family names in your territory best adapted for your designs. Seek out the influential individuals bearing the names that you have selected, give them the "suggestion," and with a little assistance they will do the rest. But it is not the Smiths, Browns, Joneses and Robinsons, necessarily, that make successful reunions. Select names that are perhaps unusual enough to excite interest in those bearing them as to the extent of the family connection. In this same way picnics on the holidays of all the nations of Europe are made profitable. Secret orders, particularly the military branches, use special cars nowadays to a great extent, visiting other lodges or gathering for an outing or parade. Banquets having political "blackbirds served in a pie" are more enjoyable when partaken of at some pleasant resort. Labor unions can muster thousands for all purposes from sympathy meetings for raising aid to most enjoyable outings with field sports on the programme. Special features for children's days are fancy dancing for prizes by a limited number of entries from each city on the system, free rides on the carousel for the first thousand entering the park, a Scotch Highlander bagpiper, or some such inducement. Band competitions, firemen's play-outs, sham battles, farmers' days, county fairs, street carnivals, military tournaments, etc., require more of company assistance, but they seldom fail to fill the receivers' safes. Sometimes the public is in just the humor for a big barbecue, clam-bake or watermelon cutting, and the unusual feature causes a great deal of talk. Sports of all kinds are an unfailing source of revenue. Some companies own baseball franchises and maintain the grounds. Where the haul is short, the population large and the enthusiasm high, the result is certain. Much can be done also by working up minor leagues for baseball, handball, basketball, bowling, etc.; getting up track meets, games of Gaelic football, launch, boat and canoe races, automobile contests, swimming matches and dozens of other variations that play on the national love of exercise.

I do not advise road managements to adopt the methods that are followed in popularizing a midway at a great world's fair, nor should they all attempt to have Dreamlands on their line, but there are many good drawing cards among the "big spectaculars" that amusement companies are ready to give at your resort, such as water spectacles showing land and sea battles or volcanic eruptions, engine collisions, submarine boats, fake airships, diving horses and elks, and the whole series of balloon and parachute acts. These require careful planning if they are to be made successes, and not, as in some cases that have shocked the country, catastrophes. Crowds must be kept under control and at a proper distance. At one resort this last summer, where an engine collision was advertised, the crowd forced its way too near the track, a panic followed, the management refused to give the exhibition and the disappointed ones wrecked the hotel on the grounds. At the least, these spectacles call for constant watchfulness or your water-walker may go out into the lake for his act in a dangerous state of intoxication and make the spectacle ridiculous and perhaps serious. I am somewhat "gun-shy" from experience with these features, but if you know where to look for trouble and avert it you can sometimes use them to great advantage. Some resorts have permanent features, such as captive balloons, imitation battleships floating in the lake, and even submarine boats. I shall make no mention of the long list of customary permanent features at amusement resorts, but only of the movable ones traveling the country over or of permanent features of an unusual nature. The traffic man's business is not park building, but creating travel.

Sometimes a spectacle company can be secured for the entire season at a very low figure which is prepared to give a dozen of the smaller feats, especially if the contract is made early enough in the season. This gives them a "backbone" to work on during the summer; and they will fill their side contracts for special days or weeks at other resorts at a higher figure of profit. They can usually give two performances, afternoon and night, and as many Sunday "stunts" as wanted, varying the act each week. Their repertoire usually includes the balloon acts—single and double ascensions, single and double parachute drops, balloon races, cannon and torpedo release parachute drop, etc.; the "slide for life," high dive, bicycle act on high wire with trapeze, bicycle dive into water, loop the loop and loop the gap, high-wire walking, walking on water, etc. Aside from the regular attractions at the resort, a spectacle of this kind is a good focusing point for the afternoon's or evening's entertainment features.

Most amusement resorts have their own band, but special band concerts, especially on Sunday afternoon, with some well-known organization, or the local bands, either single or combined, are always high cards in drawing crowds. Their entertaining value, and incidentally their advertising value, are heightened by the addition of a popular soloist, either vocal or instrumental, without too much extra expense.

A few good animals, without attempting to make the menagerie too large, pay as a rule; but this is a matter to be decided by local conditions, in which many things enter besides the size of the population to draw from.

The traffic man, though, can make his greatest financial hits for the road by taking advantage of sudden opportunities, like the stock broker. Accidents, large fires and other calamities can be made to yield money for the road if the traffic man does not allow his enthusiasm to appear too cold-blooded. If a freight train wreck has been rapidly photographed and the pictures displayed, and notice be made of the location of the wreck on the bulletin boards at terminal points, the car-fare results are likely to equal those from a prepared engine collision of the spectacular order. Large fires, explosions, floods are in this class. I have known of instances in the interior where the discovery of large fossilized bones has been seized on to draw thousands. On the coast, races at sea, battleships in port, new vessels on trial runs, launchings, the appearance of a school of whales have been treated in the same way. As an instance in point to show how the traffic man must be prepared to work rapidly when the proper moment comes, it is the custom to have dasher signs printed in advance for some events which may be supposed reasonably to occur once or twice in a season. He will have in his bill room a supply announcing:

HIGHEST SURF IN MANY YEARS AT BLANK BEACH

The Sight of a Lifetime

or perhaps another pile ready for the dashers and wall cases and bulletin boards reading:

BLANK RIVER ON A RAMPAGE

Crowds Line the Banks

If the road has no resorts there are certainly some picnic spots on the line, a grove or perhaps a hill from which a view may be had. May-flower and arbutus hunting and autumn leaf gathering and botanical expeditions may be held forth cleverly as inducements for city dwellers to take a little suburban ride. If your line goes no further than the city limits find something inside to draw the crowds to. How many people in New York go within a mile of the obelisk and yet have never seen it, simply because they have never received the direct suggestion? They know that it is there; that if their interest in it is ever awakened they can view it; but nothing ever quickens this knowledge into impulse.

The most important matter of excursions I have purposely left until near the last. Special car business from points along your own line can be greatly increased by some "heavy thinking and light hand-shaking." In the territory outside the zone directly served by your own line there is plenty of money waiting for the proper suggestion to start it your way. Up-to-date electric railways are now running joint excursions, and some even enter into arrangements with the steam roads and give people living comparatively near to some resort or historic spot the opportunity that they had never had, because they did not know enough about the schedules of the two lines to make the trip easily. I brought 780 people over 25 miles of steam road before they connected with the electric cars, and had their patronage all day from 10 a. m. to 7 p. m. in the restaurants and at the amusement devices, and my share of the advertising was only $13. Also one carload went in another direction over the lines of the company when they left the steam train on a trip to the coast that cost 90 cents apiece for the round trip. That excursion was repeated several times, and when the weather was favorable the same success resulted. I have brought special excursions of fraternal orders, high schools, Sunday schools, etc., miles over the steam roads before connecting with the electrics, and have always found that they liked the novelty. Frequently, if they receive the proper suggestion, they prefer to get up the excursion themselves to make money for their society. I give them a rate for the special cars and help them on rates with connecting roads, details of transportation, advertising, etc. They charge what they please for the tickets and settle with the roads for the special cars. This plan frequently nets quite a little sum for their treasury. The main hitch with electric railways in getting up joint excursions is the apportionment each should receive from the specials and what they should pay for the crews, but more particularly the difficulty in arranging joint excursions is the matter of liability in case of accident. That can be adjusted by a joint agreement, the tickets bearing some form like this on the backs: "The One, Two & Three Street Railway in issuing and selling these coupons, which are good for passage between Blank Square and Railway Park, acts only as agent of and for the Four, Five & Six Electric Railway and the Seven, Eight & Nine Electric Railway, and assumes no responsibility for any negligence whereby any passenger is injured or his property is injured or lost on any line other than its own, and the purchaser accepts the coupons subject to the above condition."

Sometimes where an organization guarantees several hundred on a joint excursion, the special form of ticket printed can include the stub and the coupons for the fare limits of all the connecting roads, and even dinner, launch or theater coupons. This requires quite a little extra bookkeeping, but when the trouble taken brings several hundred people from a distance who had never seen your resort the "word of mouth" advertising that they do when they return home is almost to be figured among the assets for future seasons. I have sometimes gone so far out of the usual zone of travel for my lines that arrangements had to be made with three other connecting lines before the special car could be run. Each road supplies a pilot as the car comes onto its tracks. The opportunities in this direction are only limited by the traffic agent's ingenuity and the time he is willing to give to perfecting his plans.

The real estate business has been entered into successfully by many roads. Suburban lots are boomed and sold, and sometimes wholly new communities have been planted by the electric railway. The traffic man, when he sees a new house going up in the suburbs on his line, can set down in the asset column an additional $30 per year for every adult male occupant if inside the fare limit to the center of the city and $60 per year if outside the fare limit. In other words, every new house is as good as a special car rented.

But summer is not your only harvest. Winter is not necessarily solely for fighting snow and ice and for retrenchment. Along your lines perhaps there are good spots for fishing through the ice, skating, curling, horse trotting, ice-boating, hockey contests, etc. Some roads have places where winter parties can enjoy dancing or skating at will, tobogganing or bowling or such sports as basketball. At least one road that I am familiar with has turned a brick car house, which consolidation of lines rendered unnecessary, into an immense indoor ice-skating rink, and has never had cause to regret the novel line of business.

These suggestions on traffic creating have dealt mainly with the pleasure travel, but there is a rapidly widening field in the business travel that is coming over to the electric lines from the steam roads. Business men as yet have not enough confidence in electric railway schedules, and fear delays by the power going off or some minor accident. Still, there are certain points where the electric roads have the advantage of the steam lines, and the traffic agent of the former should harp constantly on these, not forgetting to put a map of some sort into all his advertising when possible. Electric roads, as compared with the steam lines, have comparatively no noise and no smoke, dust or cinders, and they pass through more beautiful scenery with better opportunity to see it from the car window. They make trips between cities with greater frequency than the steam roads, and in almost as quick time, and at a lower rate of fare. These facts should weigh in the balance with business men when on trips where the mileage does not run over two figures, and sometimes where it does.

COLORED ROUTE LANTERNS USED BY THE SPRINGFIELD STREET RAILWAY COMPANY

Instead of using illuminated signs at night, the Springfield Street Railway Company employs an effective electric lantern for the designation of routes. The lantern is hung at the right-hand side of the motorman's vestibule and can easily be discerned by would-be passengers before the car comes within hailing distance. It consists of a small metal box frame holding two incandescent lamps, one above the other, and provided with panels of different colored glass for use on different routes. Thus, an orange light above a red signifies an "Agawam" car, a straight red light "Brightwood," and so on. The scheme appears to work very satisfactorily in the case of residents of the city, and as for strangers, the publication of all the route signs and time-tables in the various weekly "guides" displayed at hotels, clubs and other gathering places, facilitates the acquisition of the system adopted. A second lantern of the same coloring is also hung at the rear vestibule on the left-hand side of the car, facing forward. In some cases three lamps are employed to give the proper combinations.

THE QUESTION BOX

The Question Box this week includes questions and answers pertaining to general topics, the track department and the master mechanic's department. Of special interest is the description on page 604 of the portable pile driver used by the Detroit United Railway.

A.—GENERAL

A 1.—What various methods do you employ for advertising your road and its attractions?

This company is already preparing its advertising matter for the summer season's business, the experience of the writer for many years past proving it is a good idea to start on this matter early in the year. The company has four resorts, reached exclusively by the 135 miles of its system. These are as follows: Canobie Lake Park, a high-class amusement ground of 50 acres; Central Park, a smaller outing resort; Hampton Beach, with two hotels, large Casino and group of cottages owned by the company; and Seabrook Beach, exclusively for cottagers. Half-sheet posters in colors have been designed, the one for Canobie showing a girl in canoeing costume against a full shore background, and that for Hampton having a girl in bathing dress against a full surf background. Only eight words on each poster tell the name of the resort and the line that it is on, a series of half-tone panels on the margin of each poster informing the public, in better detail than any amount of description, what each place has to offer in the way of theaters, band concerts, roller coaster, athletic grounds, bathing, boating, etc. Half are printed on pasteboard and half on heavy paper. Locations have been secured in store windows and in other public places in Lowell, Lawrence, Andover, Methuen, Haverhill, Amesbury and Newburyport, Mass.; Manchester, Exeter, Nashua, Portsmouth, Dover and Rochester. N. H., and in the smaller places along the lines, and these are paid for solely with a season ticket for one of the three theaters, passing two people each week. The extra riding which originates with the possession of this pass as an incentive, and which averages 25 cents a head for the round trip, amounts to enough to make this advertising plan self-supporting from this source alone. When the public is confronted with the constant recurrence of these posters in window after window on the main streets of each city, the effect of the strong impression in creating the desire to ride is one that can be counted on. Souvenir postal cards form a splendid means of advertising a resort. As they are sent by one friend to another their effect is the same as a verbal recommendation of the resort. This is a form of advertising that really pays a large profit. For Canobie Lake Park there will be seven designs of cards in color and seven in sepia. The order will be 100,000, following the experience of last year's sales of the plain ones. For Hampton Beach four views have been ordered. A novel way of advertising the "sea-food dinner" at Hampton Beach has been devised. The menu will be printed on a postal card 7 ins. x 5½ ins. Bathing views cover the back, the daily change in the bill of fare being printed in a mortised space in the view. They may be addressed at the table and mailed from the cashier's desk. The printer is working on a little double folder to fit the ordinary size envelope, designed to draw banquet and dinner party business to the immense restaurant at Canobie Lake Park. Many large conventions were drawn there last year by featuring this big hall. The little folder has a cover design of a smiling waitress presenting the menu, the latter being enlarged in comparison with the figure, in the manner familiar to every photographer who has had to record the capture of a large fish held in the angler's hand. Inside the folder there are two panel half-tones of the restaurant and the lake, two reproductions of typical banquet menus, an outline of the facilities of the place for large spreads, quotations from the newspapers and after-dinner speeches made in past seasons praising the service, etc. Solely for advertising the hotels and cottages at Hampton Beach a booklet will go to press shortly containing half-tone views of the shore and the interiors of the buildings, with descriptive matter. Later in the season the company sends out to all organizations and societies and lodges in this territory a booklet describing the features along the lines and containing half-tones of all its resorts and "beauty spots," and making a bid for special car and excursion business. A liberal use of the newspapers, commercial billboards and boy distributers putting out maps and time-tables for the public and posting up wall time-tables in all frequented places follows in the proper season. A blotter containing a panoramic view of Canobie Lake Park, with a list of its attractions, has been printed for early distribution in cities off the lines from which excursions will be run in the summer. In past years a company publication called the "Bulletin" has attracted a great deal of attention, and has been the means of bringing the company and the public into closer and friendlier relations. Dozens of minor methods are made use of in season to boom each attraction and event and excursion according to its importance. This is the third year that this system has maintained an advertising and passenger soliciting department. As to whether it pays, the writer would state that another large New England system has this year established a similar department, with rumors of others to follow.

E. P. Hulse, Adv. Agt.,
New Hampsire Tract. Co.'s lines, Haverhill, Mass.

We use the local press for advertising our park attractions, our interurban line, and for presenting our time-tables. We employ as press agent a reporter connected with one of the local papers to do the write-ups, and find this a good medium of reaching the people. We also place banners on car fenders for advertising special attractions, and frequently distribute dodgers in cars.

Superintendent of Transportation.

Printed time cards, large 16-in. x 19-in. cards judiciously distributed, and a folder with time card in the center.

C. E. Palmer, Supt.,
Cincinnati, Dayton & Toledo Tract. Co.

A 3.—How much money can be spent profitably by an electric railway company for advertising?

Depends upon what it has to advertise. We advertise our power business by ads in daily papers and by booklets sent to all possible power users in our territory.

L. M. Levinson, Mgr.,
Shreveport (La.) Tract. Co.

A 4.—What are some of the ways by which an electric railway company can kindle and foster a more kindly feeling and a fairer treatment on the part of the public press of its community?

By taking the press into its confidence whenever possible. The policy of giving reasons for changes in service, and for the company's actions on matters of interest to the public, will bring the management into closer touch with the press, and will ensure fair treatment and a hearing before publication is made, unless there are particular reasons for the press to be hostile.

Superintendent of Transportation.

By keeping the papers advised of matters of public interest, such as changes in schedules; by giving press representatives free transportation, and by taking advertisements in the papers.

L. M. Levinson, Mgr.,
Shreveport (La.) Tract. Co.

A 5.—What are some of the ways by which an electric railway company can kindle and foster a more kindly feeling toward it on the part of the public?

By having business-like employees and trainmen of good manners; by maintaining schedules; by furnishing clean cars, and by strict care and prompt return of all lost articles found by employees on cars.

L. M. Levinson, Mgr.,
Shreveport (La.) Tract. Co.

A 6.—Several electric railway companies are publishing regular leaflets or periodicals for public distribution, with the idea of bringing about a better relation between the company and the public. What do you think of this suggestion? Have you ever tried the suggestion of publishing such a periodical? What were the results?

The writer was much interested in reading the many replies in the Question Box Department of your issue for Feb. 18, page 319, in answer to Question A 6, referring to company publications. As early as 1902 the writer was publishing a four-page leaflet in the interest of the Georgia Railway & Electric Company, of Atlanta, Ga. This was called the "Daily Amusement Programme and Street Railway Bulletin." The daily issue in the spring of 1903 was 10,000, or 60,000 weekly (no Sunday paper being published), which I believe is a larger edition than was ever printed by any company for a publication of this character. It stood high in public favor, the chief of the fire department, for instance, sending in a "fire-line" badge with the announcement that it was the best newspaper in the city. Commencing with June, the edition was run up to 12,000 daily, then 15,000 and even 18,000 on special days. The first year the company had the printing done at a fixed price per thousand. The second year printing presses were located in one of the car houses, and the "Daily Bulletin" and some of the small printed forms of the company were handled there. This printing plant was leased, the advertisements in the "Bulletin" sustaining it. The feasibility of this as a regular plan is doubtful; much depends on the man engaged to run it. This plan enabled us to make night runs of the presses, when necessary, up to almost the time that the first cars started out. The folders were distributed not only in the cars, but piles were left in public places, such as hotels, cigar stands and soda water fountains; also about a hundred bunches of the leaflets were strung up to trolley poles at favorable points. This was done by a boy in the early morning hours. We found that all the leaflets in these bunches were taken before 10 a. m. each day, and constant inspection of the street and sidewalk showed that few were thrown away and none maliciously torn down. Hundreds of people kept "complete files" of the publication each year. I have even considered the advisability under certain circumstances of supplanting newspaper advertising in the summer with a large edition of a bulletin. Newspapers are not read as closely in the summer months as in the long winter evenings, and I have always favored putting the suggestions directly into the people's minds, unhampered by competition with other matters of interest.

E. P. HULSE, Adv. Agt.,
New Hampshire Tract. Co.'s lines, Haverhill, Mass.

Good. We do it each year. The educational pamphlet if properly edited results in fewer accidents and educates the people into the habit of getting on and off cars more promptly.

L. M. LEVINSON, Mgr.,
Shreveport (La.) Tract. Co.

A 8.—A company wishes to carry is own fire insurance by setting aside a certain percentage of its gross receipts each year to cover fire losses. What would be a safe percentage to allow?

Two per cent. L. M. LEVINSON, Mgr.,
Shreveport (La.) Tract. Co.

A 9.—Under what conditions can an electric railway company venture to carry its own fire insurance on its various properties?

The writer does not think a company can afford to carry its own fire insurance on its various properties unless buildings are so constructed as to be practically fire-proof, and are separated or divided in sections so arranged that fire could not spread and cause a general conflagration. SUPERINTENDENT OF TRANSPORTATION.

If it has good organization of its barn employees with plenty of water, pump, fire hose and two well drilled foremen, one for day and one for night, who know what to do in emergencies. Water pressure must be at least 65 to 75 lbs. per square in., and fire hose must be of ample strength and good quality.

L. M. LEVINSON, Mgr.,
Shreveport (La.) Tract. Co.

A 10.—What percentage of your gross receipts are you paying out through the claim department?

For 1903 our claim department expense was 35-100 of 1 per cent of gross receipts. In 1904 this was reduced to 14-100 of 1 per cent. We think this low percentage is partly due to very rigid accident report rules, which are lived up to, and merit system of discipline, allowing small credits for every correct accident report turned in, and severe penalties for failure to turn in report. In this way we get complete reports on all minor accidents immediately, and this is generally quite an advantage.

R. P. STEVENS, Supt.,
Everett (Wash.) Ry. & Elec. Co.

About 5 per cent. L. M. LEVINSON, Mgr.,
Shreveport (La.) Tract. Co.

A 11.—A company wishes to set aside a certain fund each year to cover all accident claims. Should this fund be based on a definite sum per car-mile, or on a percentage of the total gross receipts? What would be a proper allowance?

About 8 per cent of the gross receipts, where the Supreme Courts are liberal, and all construction work is of the safest kind.

L. M. LEVINSON, Mgr.,
Shreveport (La.) Tract. Co.

I.—THE TRACK DEPARTMENT

I 1.—In the construction of a suburban or interurban electric railway, what are the deciding factors in determining the weight and section of rail to be used? State what weight and section you prefer, and why.

Weight on each wheel of car; width of tread; headway of trains; speed and character of bond. We prefer 80-lb. A. S. C. E. rail. ASST. ENG. RY. DEPT.

Weight of cars and speed. H. A. TIEMANN,
New York City.

Weight of car and speed. We prefer T-rail of standard section, because it makes a better and cheaper track both to construct and maintain than other sections. We are using a 60-lb. rail section, which is about right for our conditions.

J. CHAS. ROSS, Gen. Mgr.,
Steubenville (Ohio) Tract. & Light Co.

I 2.—What is the best type of rail for city service in unimproved streets?

Ordinary T if street is not to be paved. If street is to be paved in the near future, rail as described by the writer in answer to I 4. ASST. ENG. RY. DEPT.

The best type of rail for city service in improved or unimproved streets is some type of T-rail. In the writer's judgment there is no type of girder rail that has yet been devised equal to a good T-rail section. The T-rail rides easier, lasts longer and maintains better joints than any girder section. The groove-rail sections are an especially undesirable type of rail, as the groove fills with dirt, ice, snow, sleet, etc., and in addition to these dangers there is also the question of expense; elaborate types of groove now being rolled are very expensive, and yet the length of their lives is practically not increasing. As soon as the head of the rail wears down the flange of the wheel begins to ride on the tram of the rail, making very uneven riding and producing a great number of broken flanges; when the rail reaches this state of wear it is practically worn out, and the great weight of metal still remaining is only fit for the scrap heap. Regarding other types of girder rail the same evils exist, but to a somewhat lesser degree. The height of the T-rail to be used for city or interurban service depends entirely upon the paving necessary; for unimproved streets the writer would advocate a low, heavy section of T-rail, provided of course that there are no plans to have paving in the future. The low sections of T-rail are better than the high section, for the reason that they retain gage longer, as they are less liable to spread. This is very evident, as the low sections are more firmly in position and are less liable to be "upset." The writer believes that the low sections of T-rail, say 4½ ins., are the best that can be laid, presuming, of course, that the foundations are firm and lasting. The high sections with increased weight have greater strength, but this strength in many instances is not necessary on account of the excellent foundations which are now being laid under street railway tracks. P. NEY WILSON, Supervisor, So. Jersey Div.,
Public Service Cor., Camden, N. J.

I 3.—What advantages, if any, does a 9-in. girder rail possess over a 7-in. girder?

A 9-in. girder rail allows a better foundation or bed for paving than a 7-in. girder. ASST. ENG. RY. DEPT.

No advantage. A 9-in. girder rail permits use of sand, stone, or granite blocks and 4 ins. of concrete under blocks and above top of ties. The 7-in. girder rail is cheaper; is fully as durable, and permits use of brick or sheet asphalt paving with 4 ins. of concrete under same. H. A. TIEMANN,
New York City.

I 4.—If the conditions require a girder rail, which type would you prefer, semi-groove, full-groove, tram, center-bearing or Trilby section? Please state your reasons in full for the preference.

Full groove; one not wide enough to admit carriage and wagon wheels. While this small groove shortens the life of car wheels and occasionally breaks the flanges, in our particular case it saves considerably more in paving bills, as the vehicles on the street

cannot follow the track and wear grooves in the paving. This city has very strong laws regarding paving. The railway company is compelled to keep in order the paving between the tracks and 2 ft. outside the rails, and so stringent is the city that we are often reported and fined in the police court for small depressions in the paving which have been temporarily overlooked and neglected.
ASST. ENG. RY. DEPT.

I 5.—When laying tracks, what space should be left between the ends of the rails for contraction and expansion?

As girder rails in paved streets have only about one-fifth of their surface exposed to the elements, five-sixths of the rail being under the ground, the joints should be butted. Exposed rails on suburban and interurban roads should be laid according to steam railroad practice, using standard shims for every 10 degrees change of temperature. CHIEF ENG. RY. DEPT.

The question of space between the ends of the rail to provide for expansion and contraction is a mooted one, and has been given consideration and a great deal of study by some very prominent engineers. In paved streets, laid with a very heavy section of rail, we would not leave any opening at the joint at all. The writer believes that the elasticity of the metal would provide for any expansion or contraction, and, as a matter of fact, this has been practically worked out on our system. In open work, where track is exposed to changes in temperature, would leave ⅜-in. space between the abutting ends of the rail, using 60-ft. lengths, presuming, of course, that this work be laid in winter; in the summer would lay in open construction with an opening of ⅛-in. These figures have been borne out by experience. We believe, however, wherever it is possible the rail should be covered, and it has always been our purpose to keep our rails covered, at least up to the shoulder of the rail. We have some construction that is entirely open, but by using the above mentioned spaces we have had no trouble. In new construction every possible precaution should be taken in laying any type of rail to cover it up and keep it covered as much as possible. This will provide against a great variety of troubles, particularly expansion and contraction.

P. NEY WILSON, So. Jersey Div.,
Public Service Cor., Camden, N. J.

If on private right of way, in extremely hot weather lay rails end to end; in moderate weather leave ⅛-in. opening; in extremely cold weather leave ¼-in. opening. With 60-ft. rails leave twice these spaces at joints. If track is laid in country road and dirt is to be filled to head of rail lay joints close except in extremely cold weather, when one-half the spaces mentioned should be left.

J. CHAS. ROSS, GEN. MGR.,
Steubenville (Ohio) Tract. & Lt. Co.

I 6.—What are the determining factors in selecting ballast for a new suburban or interurban electric road?

Cost and suitability. J. CHAS. ROSS, Gen. Mgr.,
Steubenville (Ohio) Tract. & Lt. Co.

I 7.—What is the best material for ballast on a suburban or interurban electric road?

Broken stone, preferably lime-stone. J. CHAS. ROSS, Gen Mgr.,
Steubenville (Ohio) Tract. & Lt. Co.

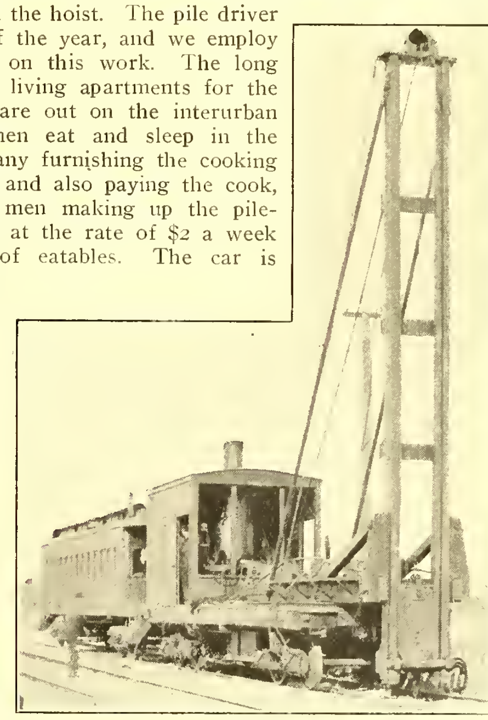
I 9.—What means, machines, devices, special rigged cars, etc., do you know of for expediting or cheapening the work of ballasting and laying track? Please give sketch or photograph and detailed description, including cost.

The Detroit United Railway has built a portable pile driver which has been used with excellent results in interurban track work, and in building trestles and bridges. The illustrations herewith show the flat car carrying the pile driver and also the long closed car which is used to push the flat car. The upright leaders of the pile driver are 38 ft. high, and the driver is provided with a 2200-lb. hammer. The frame supporting the weight

TRESTLE BUILT WITH PORTABLE PILE DRIVER

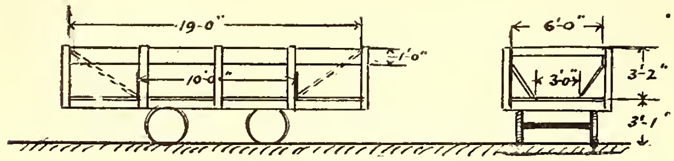
can be swung at right angles with the car to either side, and we can drive a pile 10 ft. from the center of the track on either side of the roadbed. Also, the upright frame is hinged at the bottom and can be lowered down to the top of the cab when the car is traveling over the road. In the upright position the frame is held by adjustable braces. There is a 25-hp steam hoist on the flat car for operating the hoist, and the frame is raised and lowered by special drum on the hoist. The pile driver is in use most of the year, and we employ about eight men on this work. The long coach is used as living apartments for the men when they are out on the interurban systems. The men eat and sleep in the coach; the company furnishing the cooking utensils and fuel and also paying the cook, but each of the men making up the pile-driving gang pay at the rate of $2 a week for the supply of eatables. The car is neatly furnished, having a sleeping apartment, sitting-room, dining-room and kitchen. All of our pile driving on the main lines is done at night after the regular cars are pulled in. We find this outfit effects a great saving in our bridge work as well as in track work. One of the illustrations shows the Canard River bridge on our Sandwich, Windsor & Amherstburg line in Canada. The bridge is 650 ft. long, and was built entirely with this machine, which not only drove the piles, but also hoisted the timbers into place. In working with the pile driver, we extend two girder rails out 5 ft. in advance of the last bent, which enables us to drive the next bent. The piles are then sawed off and the cap and stringers are hoisted into place with the aid of the hoist on the pile driver. This bridge was built at a cost of $9 per lineal foot, which price included all labor and material. The timber and piles were white oak. J. KERWIN, Supt. Tracks,
Detroit United Ry.

PORTABLE PILE-DRIVING OUTFIT, DETROIT UNITED RAILWAY

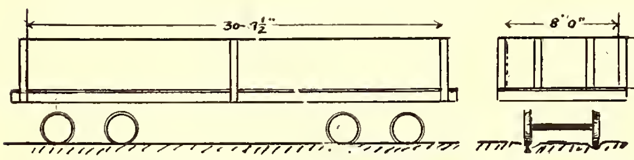


FRONT VIEW OF PILE DRIVER

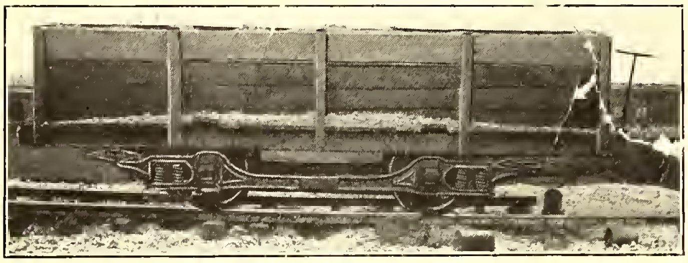
We have found the slag cars shown in the accompanying illustrations very convenient for handling slag for ballast. We use two types of cars, a box car having 18 cubic yards capacity, and a dump car having 10 cubic yards capacity. With the dump car we



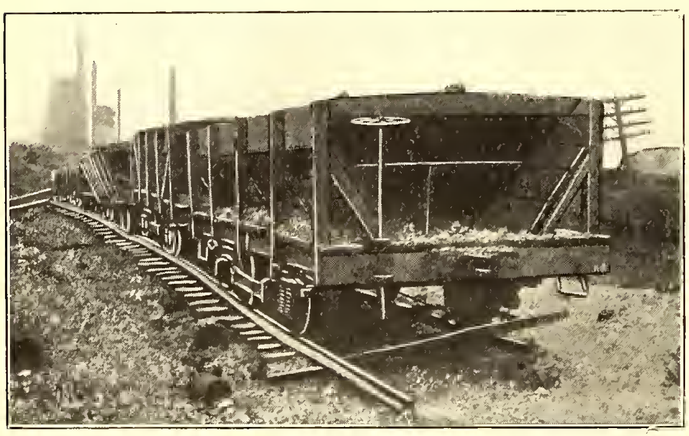
SIDE AND END ELEVATION DUMP CAR, BIRMINGHAM



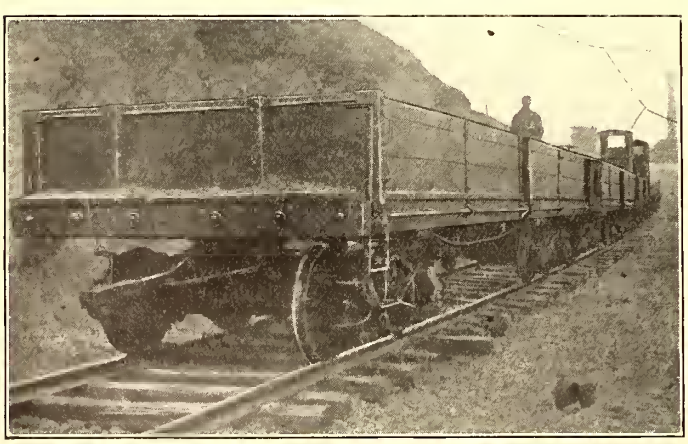
SIDE AND END ELEVATION SLAG CAR, BIRMINGHAM



SIDE VIEW OF DUMP CAR



END VIEW OF DUMP CAR



CAR FOR HAULING SLAG

are able to dump the slag wherever we want it along the tracks. The cars are handled in trains drawn by electric locomotives.

Geo. H. Harris, Supt. Ry. Dept.,
Birmingham (Ala.) Ry. Lt. & Power Co.

I 14.—Have you had any experience with "creeping" rails, and how have you remedied this difficulty?

The creeping of rails is due to expansion, and is particularly evident in hot weather. We use 60-ft. rails in partly open construction, and from practical experience we find that the creeping due to expansion is not any more evident with our 60-ft. lengths than it is with our 30-ft. lengths. The most serious problem in this connection is the fact that the creeping will push the special work out of its proper position. The only ways to remedy this difficulty that have come to our attention, are either to cover up the rail flush to the head, reducing the expansion to a minimum, or else cut out a small section of the rail when the creeping would cause a dangerous condition. We had a peculiar experience in this connection. We were building some girder track, and while it was still open and subject to the direct rays of the hot sun it went so badly out of alignment that it became dangerous. A sprinkler was sent over the tracks and after the water had cooled the rail we found that it went back into its normal position.

P. Ney Wilson, Supervisor, So. Jersey Div.,
Public Service Cor., Camden, N. J.

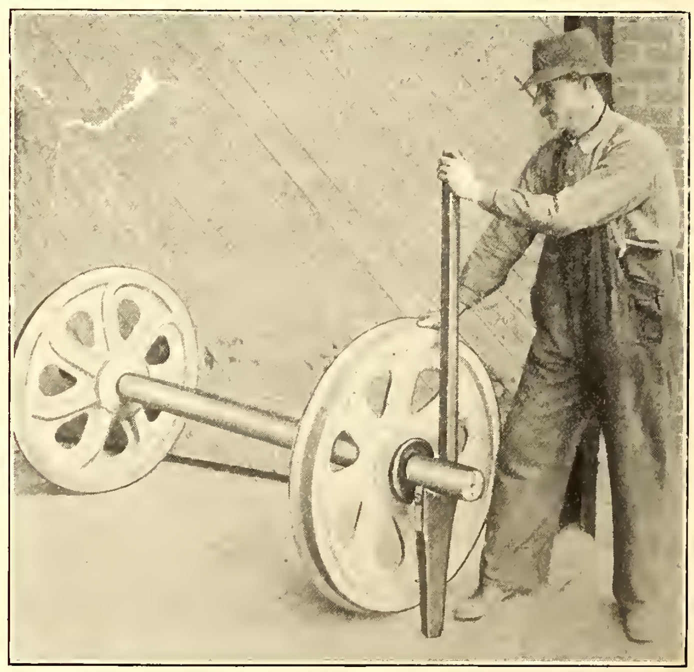
E.—THE MASTER MECHANIC'S DEPARTMENT

E 130a.—A road has had considerable annoyance due to hand hole covers on motor cases becoming loose and dropping off. What can be done to stop this?

We had trouble at one time from this source. Investigation developed the fact that the trouble was due entirely to carelessness on the part of the men who inspected the motors, as they did not always take the trouble to see that the bolt holding the hand hole cover was properly tightened. We began charging the price of lost covers to the men responsible for this work and have had no more annoyance from missing covers. The men were instructed to use a spring washer whenever they found a nut that worked too easily on the holding bolt. Schenectady Ry. Co.

E 148a.—What apparatus do you use for handling wheels and axles around the shops?

The accompanying illustration contains a good suggestion for handling wheels and axles about the shops. The tool shown is made of wood. The distance from the notch to lower end of tool is just a trifle longer than the radius of the wheels to be handled.



TOOL FOR HANDLING WHEELS AND AXLE

With this lever one man can take the heaviest pair of wheels and axle all over the shop with little trouble, turning the wheels around corners, lifting them on and off trucks, etc., with ease.

Anonymous.

E 154.—What is the best method of cutting circular discs of glass for headlights?

One of the well-known supply firms makes a special machine for cutting circular headlight glasses. I have used it for some time and found it satisfactory. D. F. Carver.

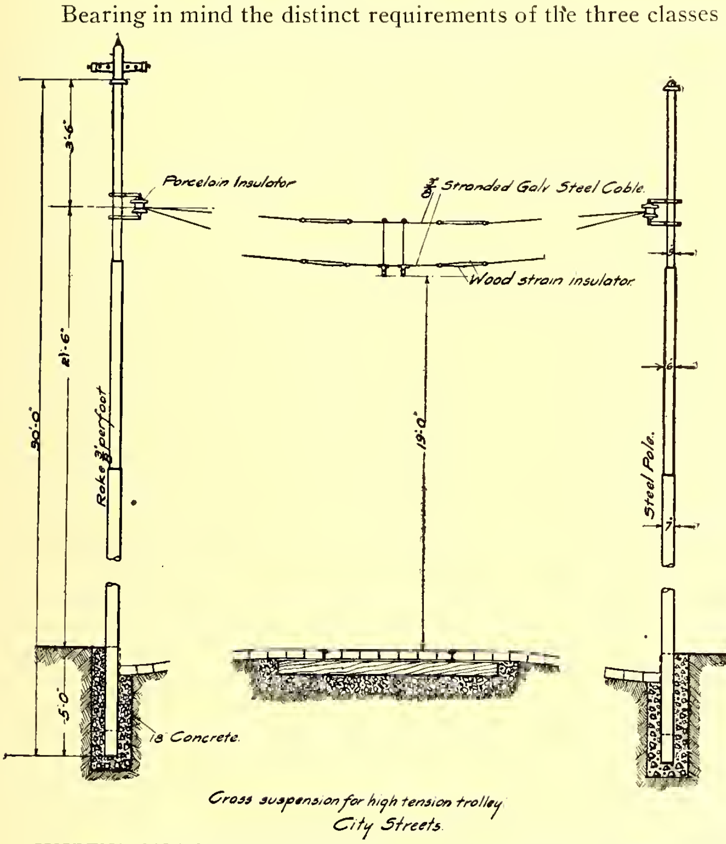
LINE CONSTRUCTION FOR HIGH-PRESSURE ELECTRIC RAILROADS

An interesting paper on this subject by George A. Damon was read at the meeting of the American Institute of Electrical Engineers held in New York, March 24, 1905, by Prof. Sever, in the absence of the author.

Mr. Damon first described the line construction in use on the Valtellina three-phase, Spindlersfeld single-phase and Huber experimental lines in Europe, and then that on the Lansing, St. Johns & St. Louis Electric Railway, the Indianapolis & Cincinnati Traction Company and the Bloomington, Pontiac & Joliet Electric Railroad in this country. As particulars and views of all of these lines except the last have been published in these columns, and as a description of the Pontiac overhead construction appeared last week, the diagrams of the Pontiac line construction are published herewith, together with Mr. Damon's general conclusions:

REQUIREMENTS OF INSTALLATION

Bearing in mind the distinct requirements of the three classes



SUSPENSION FOR HIGH-TENSION TROLLEY IN CITY STREETS—BLOOMINGTON, PONTIAC & JOLIET RAILWAY

of roads already referred to, the problem of line construction may be discussed under the following heads:

1. Pressure and Insulation.
2. Location of Conductor.
3. Requirements for Safety and Stability.

As an entire paper might be devoted to any one of these subjects, there is offered an opportunity for considerable discussion.

Pressure and Insulation.—The single-phase lines now in operation in this country have 3300-volt trolleys, and several lines under construction have also decided to use this pressure. From present appearances, therefore, 3300 volts is to be the standard for interurban lines. It would be well, however, to consider just at this time whether it would not be advisable to use a trolley pressure of 6000 volts. From an operating standpoint there seems to be no reason why this higher pressure is not just as practicable as a lower one; and to get the full benefit of all the advantages inherent with the high-tension system the higher pressure should be adopted.

Even if a few of the first roads are built with a 3300-volt trolley, there is no reason why, with the catenary suspension, the insulation provided should not be capable of standing a working test of 6000 volts, so that when the time comes to double the pressure the expense of the change will be a minimum.

For steam railroad conditions, the larger amount of energy required indicates that a pressure of at least 15,000 volts will probably be desirable. Just where to strike a balance between the cost of copper and the cost of insulation for steam road work is a problem which should be carefully worked out; but there seems to be no reason at this time why pressures of over 10,000 volts should not be considered.

The catenary form of suspension affords so convenient a method of insulation that it should become standard practice for interurban electric lines. When selecting an insulator for this construction, mechanical strength should be the first consideration, and a few cents more spent on the insulator will insure an abundance of insulating qualities. As far as insulation is concerned, there is no reason why the catenary construction could not be operated at more than 30,000 volts, if desired. For pull-offs and cross suspensions to iron poles special porcelain insulators are being designed and used with success.

It has long been admitted that dry wood is one of the best insulators. The convenience with which a wooden rod fitted with suitable terminals can be worked into an overhead construction will commend this form of insulation. Impregnated with an insulating compound, and of sufficient length to withstand high-pressure tests, the long wooden insulator is applicable to the insulation of guy wires, anchors and cross suspension wires. Its use in actual practice will be watched with interest.

The use of a wooden bracket to hold the insulator for supporting the catenary will probably appeal to some as a step backward. As far as looks are concerned, however, it may be said that a wooden bracket of a section 3.5 ins. x 5 ins. presents an appearance fully as attractive as the ordinary cedar pole to which it is attached; and that a double-track road with a line of center poles equipped with wooden brackets will be much less offensive from an æsthetic point of view than a double row of side suspension poles raked outward in the usual fashion.

The wooden bracket has an element of safety not possessed by an iron support, as the insulating properties of the wooden arm would be useful in the case of the failure of an insulator. Unless the wooden bracket were wet it would safely hold up a 6000-volt catenary until the line could be repaired.

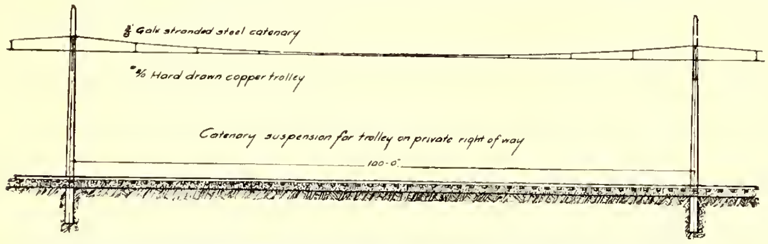
LOCATION OF CONDUCTOR AND COLLECTOR SYSTEMS

For moderate speed roads the natural tendency will be to have the trolley wire where it has proved to be so thoroughly satisfactory—that is, over the center of the track, and to continue to use the present trolley harp and wheel. For speeds not exceeding 40 m.p.h. to 50 m.p.h. at trolley pressures up to 3300 volts, this arrangement will work satisfactorily.

For high-speed electric lines there will be little objection to the conductor wire remaining over the track, provided it is properly suspended; but the danger of the ordinary trolley wheel jumping off the wire at high speeds will, no doubt, suggest the use of some form of collector other than the wheel. The bow, the roller and the shoe will each find advocates until more experience has been obtained and the results are reported and discussed.

Special cases will arise such as the installation of a high-pressure conductor wire over a road already equipped with a direct-current trolley, as was the case with the Ballston, N. Y., road. In such an event the catenary construction can be very nicely adapted to suspending the wire at the side of the track. This location could be advocated for an entirely new installation on the grounds of cheaper first cost and some additional safety in case the wire should break and fall, but both these arguments lack sufficient weight to establish the wire in the side position as standard practice.

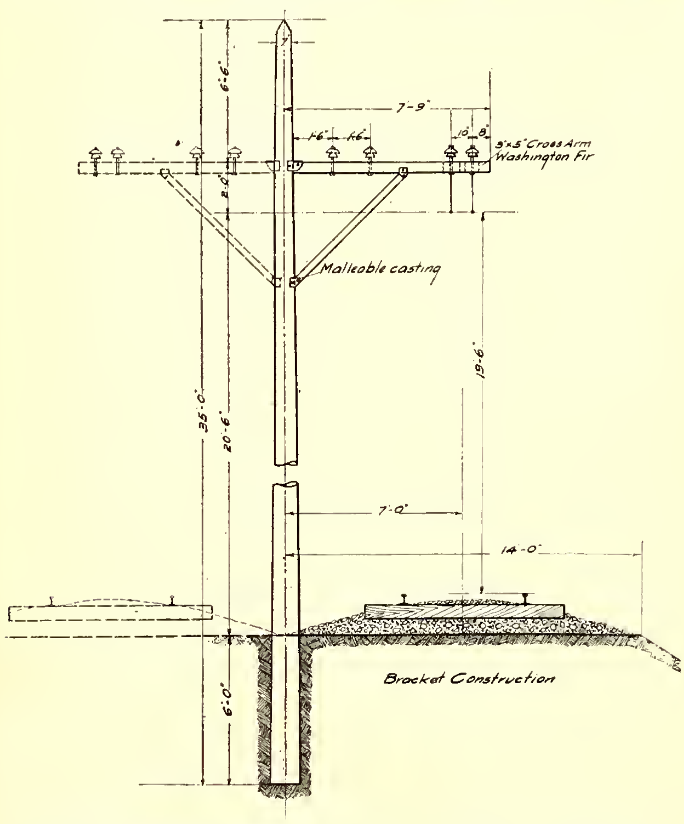
For steam road conditions considerable objection may be found to locating the conductor wire over the center of the track: the danger to trainmen standing on top of the cars; the fouling of the conductor; the deterioration of the insulation, and the destruction of the wire and supporting cables by the gases of locomotives which may jointly occupy the tracks; the blocking of traffic when it is necessary to repair a broken wire—all these are serious drawbacks to this location of the conductor for heavy railroad practice. To avoid the deleterious effect of



CATENARY SUSPENSION FOR TROLLEY ON PRIVATE RIGHT OF WAY ON BLOOMINGTON, PONTIAC & JOLIET RAILWAY

the locomotive gases it would seem to be imperative to place the contact wire at one side and as low as possible consistent with general safety. The advisability of installing an independent and duplicate system of conductors is also to be considered for lines of importance; this can be done only by putting the wires on opposite sides of the track.

The Huber system appears to have been carefully worked out, and at the present time is the best suggestion for a solution

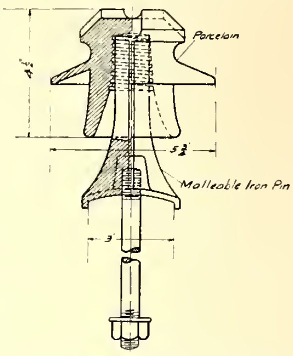


BRACKET CONSTRUCTION ON BLOOMINGTON, PONTIAC & JOLIET ELECTRIC RAILWAY

of the line problems in connection with the electrification of steam roads. There is one serious objection to the arrangement, but this can be overcome. The contact wire carried from pole top to pole top is liable to break, and some form of support should be devised to prevent the broken ends falling to the ground. A double-catenary suspension system with one wire carried on an insulator at each end of a cross-arm attached to the pole, say a foot from the top, could be provided, and the contact wire could be supported from the apex of triangular supports attached to the two catenary wires. This method would offer advantages over any system of guard wires or cradles which might be devised to catch the broken wire, as it would require three wires to be broken before any part of the system could fall to the ground.

REQUIREMENTS FOR SAFETY

Frequent Supports.—Whatever method of construction is followed, every precaution should be adopted to prevent accidents to the public or employees from the loose ends of a broken live wire. Suspensions or supports properly installed every 10 ft. to 15 ft. will lessen this danger.



MALLEABLE IRON PIN USED ON BLOOMINGTON, PONTIAC & JOLIET LINE

With bracket construction having poles about 100 ft. apart, there will be no need of a double-catenary suspension for the wire which is to be used with an under-running collector. In such a case, the double suspension would mean twice as many insulators as would be required with the single catenary, thus decreasing the insulation resistance and increasing the chances for trouble. With what is known as the "tower" method of construction—using long spans—the double catenary, spreading at the points of insulated supports and converging together at the center of the span, will be found desirable. The necessity of keeping the wire from swaying will justify the double catenary in this case, and the fact that the number of points of support is reduced by using long spans will more than balance the use of two insulators at each support.

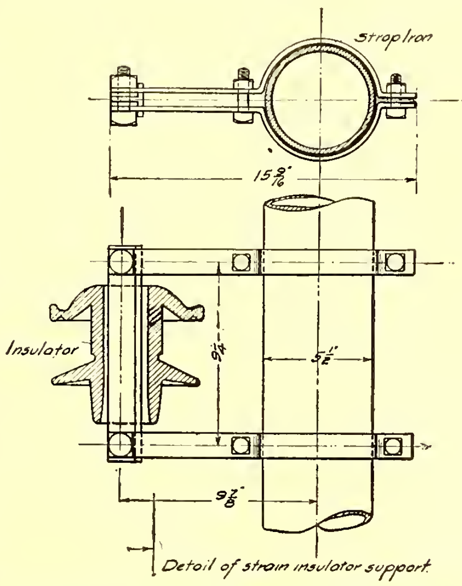
The frequent clips holding the contact wire are not only advantageous from the standpoint of additional safety, but they contribute to the permanency of the construction by keeping the wire almost perfectly horizontal at all temperatures, and thus avoiding the bending of the wire up and down at the support points every time the collector passes. The only disadvantage to clips holding the wire every few feet is the tendency for the trolley wheel to spark at these points. This is not a serious objection if a collector similar to the bow device is used, in which case there will be no interference between the collector surface and the mechanical clips.

Protection From Sleet.—In a hard sleet storm every attachment connected to the wire will naturally be the cause of additional trouble. The arcs due to a coating of ice between the wire and the collector will be much more vicious at 6000 volts to 15,000 volts than at 500 volts, but there is no occasion to become alarmed at the possible danger from this source. In this country one of the high-pressure lines using a trolley wheel on a 3300-volt wire has already passed through a hard siege of sleet; and though the sparking was spectacular, very little damage was done. The frequent trolley supports, however, added considerably to the sparking.

Greased trolley wires are sometimes used to prevent the trouble caused by sleet; it would be interesting to learn the experience of members of the Institute with this device. It is well known that the grease finish of an aluminum wire prevents the collection of sleet upon the wire, and it may be possible that a coating of grease on the high-pressure conductor wire would entirely obviate this trouble. It is evident that with a collector taking the current by means of a contact made on the top of the wire, as in the Huber system, the trouble from sleet would be a minimum. In those kinds of sleet storms in which icicles are formed and hang from the wire, a top-bearing collector would have every advantage, but when the sleet freezes equally all round the wire, the lighter pressure of the top-bearing contact might put the Huber collector at a disadvantage.

Transmission Lines.—The transmission lines from the power plant to the sub-stations will be at a higher pressure than the trolley pressure, and will therefore require careful treatment. For a road which is to be built economically, a single set of transmission wires serving all of the static transformer stations in parallel will be sufficient. These transmission wires will ordinarily be carried on the tops of the same poles which support the trolley bracket.

The next refinement would be to have a separate set of transmission lines from the power house to each sub-station, making it possible to put the overload protective devices on the central station switchboard and thus eliminate the sub-station attendance. With this multiplicity of wires and consequent higher first cost adopted, it is but one step further to separate entirely the two systems and to install two pole lines on the same right of way; where the electric road is of the high-speed class this should be done.



DETAIL OF STRAIN INSULATOR SUPPORT USED ON BLOOMINGTON, PONTIAC & JOLIET SINGLE-PHASE RAILWAY

To be consistent, however, in insuring safety to the public, it would be well to advocate as standard practice the plan of carrying the high-pressure transmission lines entirely around small towns and cities instead of through them. If the transmission lines are too dangerous to be carried on the railroad company's trolley poles, then there is more danger in carrying them along the streets and over the network of telephone wires inside the corporate limits. The problem of the proper regulation for this situation is one that will shortly have to be faced.

The first investment in the transmission line, the cost of maintenance, and the loss by leakage—all these can be cut in half by thoroughly grounding one side of the single-phase transmission line so as to use the earth as one leg of the circuit. An actual trial of this suggestion to further simplify the distribution system is under contemplation, and no doubt will furnish valuable information as to its effect on telephone and telegraph lines as well as data in connection with the resistance of the earth with alternating currents.

Grounded Guard Wires.—Where the transmission lines pass over other wires there should be a cradle of grounded wires to prevent a broken transmission line from coming in contact with a foreign wire. This cradle will be of little use unless it is of ample dimensions. Some effort has been made on European roads so to install grounded wires that the breaking of a conductor would at once cause the live end of the wire to make a contact with the grounded guard wire, but in two cases which have come to notice the grounded guard wire caused more trouble than it eliminated; for this reason it was soon abandoned. In order to encourage the discussion of the unsettled features of line construction for high-pressure electric railroads the following are offered as

GENERAL CONCLUSIONS

1. There are no reasons why the standard pressures of the conductor wire for interurban electric lines should not be at least 6000 volts; this is suggested as a standard in order to provide for interchange of equipment.

2. For the electrification of steam roads a pressure of about 15,000 volts on the conductor wire is desirable.

3. For electric interurban lines the present tendency is toward the catenary form of suspension, with the trolley over the center of the track. A connection should be made about every 10 ft. between the steel catenary wire and the trolley wire.

4. For steam railroad conditions a contact wire at the side of the track appears to offer the greatest advantages. Some form of construction should be adopted, however, to prevent the falling of the conductor in case it should break.

5. A successful bow collector for interurban work and a contact arm for steam road installations similar to that in use by the Huber system would allow the location of the contact wire to be standardized.

6. A trolley wire 20 ft. above the center of the track is suggested for interurban roads. For steam road electrification the height of the contact wire at the side of the track could be made standard at 16 ft.

HIGH-PRESSURE LINE CONSTRUCTION FOR ALTERNATING-CURRENT RAILWAYS*

BY THEODORE VARNEY

The chief advantage to be derived from the direct application of the alternating current to railway service is in the use of high trolley pressures. Having a successful alternating-current motor, the remaining problem of greatest importance is the method of supplying current to the car. The third rail, which is largely used in heavy railway work, is obviously unsuited for carrying 3000 volts, 6000 volts or 10,000 volts on the score of insulation and of safety. Moreover, the third-rail construction, whatever be the pressure, is not suitable for terminal yards in which there are many tracks and in which derailments are not unusual. A smash-up would be almost certain to result in tying up the system.

Of the various methods of current supply heretofore employed the overhead conductor is believed to be the only one capable of development into safe or permanent operation with trolley pressures running up into thousands of volts. The present paper will describe some preliminary work which has been carried out on a practical scale with overhead conductors. In laying out a suitable overhead high-pressure alternating-current system it was decided to make a radical departure from the present methods of construction wherein the insulation is made only good enough and the supporting structure only strong enough to keep the cars running by the aid of an efficient repair department. It was rather the aim to obtain a system which would be serviceable and reliable for several thousand volts and which when once in place would at least equal in durability and cost of maintenance the bridges, track and other portions of a standard railroad. While the exacting conditions and heavy traffic of the present steam roads will require for successful operation by electricity a carefully planned and substantial construction, the lighter interurban roads may frequently be equipped with a less expensive system.

Several classes of construction have been designed; of these the least expensive type employing bracket arms will be described first.

* Paper presented at a meeting of the American Institute of Electrical Engineers, New York, March 24, 1905.

BRACKET-ARM CONSTRUCTION

This system consists of a single line of wooden poles spaced well apart and fitted with bracket arms and steel catenary suspension cable for supporting the trolley wire. The bracket arm is a T-iron supported by a tension rod at its outer end and fitted at the inner end with lugs which partly embrace the pole and to which they are bolted with lag

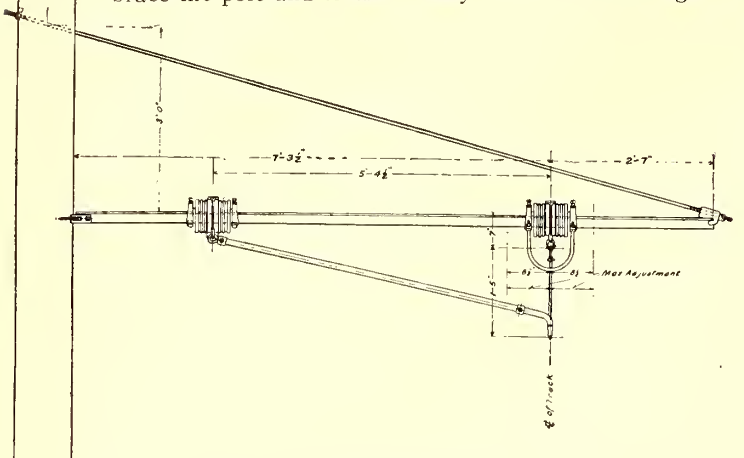


FIG. 1.—T-IRON BRACKET WITH MAIN INSULATOR AND STEADY STRAIN

screws. Fig. 1 indicates the construction. The ininslator is of corrugated porcelain, cemented to a malleable-iron sleeve, which in turn is slipped over the bracket arm and held by clamps and set screws. The porcelain insulator has a groove at its center surrounded by a malleable-iron

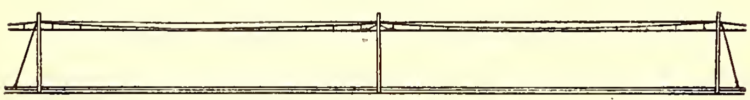


FIG. 6.—ANCHOR SCHEME

collar similar to a pipe clamp. This collar has an eye on the lower side into which the hooks of a clamp which carries the steel supporting cable or messenger are inserted. Wheel trolleys will probably be used to a considerable extent with the lower pressures. Guard loops are provided to prevent breakage

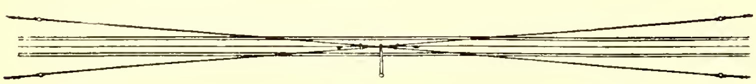


FIG. 7.—ANCHOR SCHEME

of the porcelain, in case the trolley should leave the wire under a bracket. The insulator with its fittings is shown in detail in Fig. 2.

The guard loops are also of service in temporarily supporting the cable while it is being run out and pulled up. The trolley and messenger are run out together, and the former is supported from the messenger at occasional points by temporary tie-wires. The tension in the messenger cable is adjusted to give the proper sag, and the trolley wire is pulled up tight enough to take out all kinks and bends. Both trolley and messenger are then anchored. The messenger is next clamped to the insulators and the trolley is permanently supported from the messenger by means of hangers or clips which are adjusted in length in such a manner as to hold the trolley horizontally. By this means the tension in the trolley is slightly relieved and allowance is made

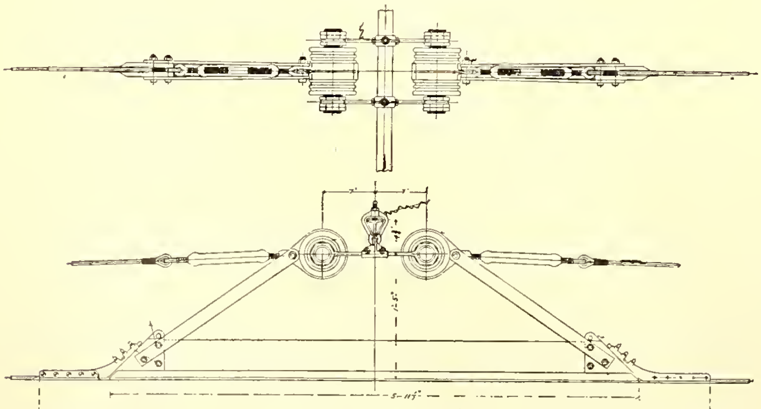


FIG. 8.—SINGLE CATENARY, SECTION-BREAK INSULATOR

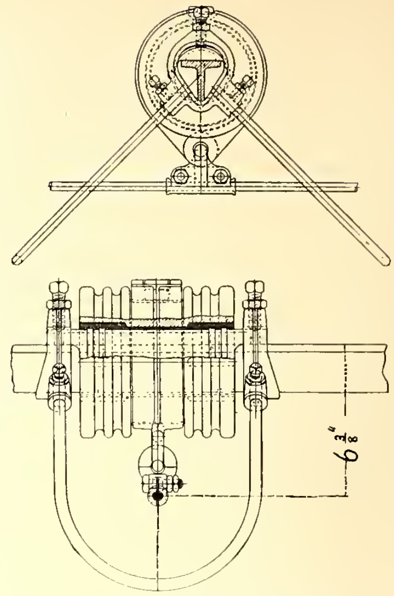


FIG. 2.—SINGLE CATENARY, MAIN INSULATOR DETAILS

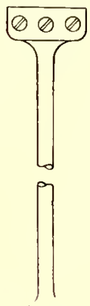


FIG. 3.—HANGER

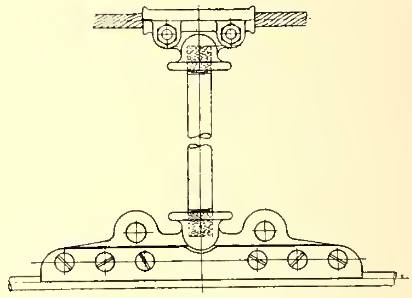


FIG. 4—SINGLE-CATENARY CURVE PULL-OFF

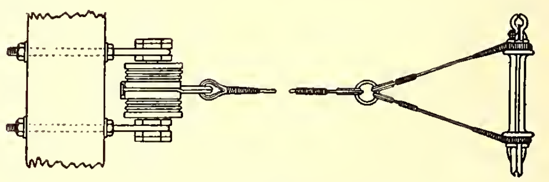


FIG. 5.—CURVE PULL-OFF

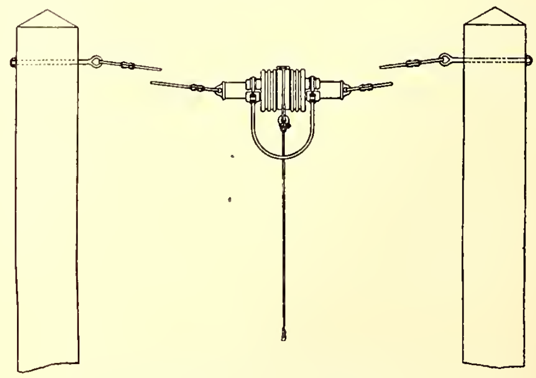


FIG. 9.—CROSS-SPAN MAIN-LINE SUSPENSION

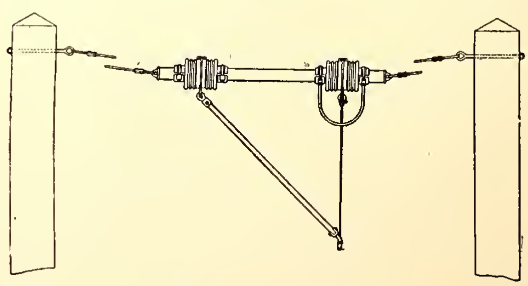


FIG. 10.—CROSS-SPAN SUSPENSION AND STEADY STRAIN

for expansion and contraction. The hangers are stiff and, being placed only 10 ft. apart, correct any tendency of the grooved trolley wire to twist. This insures that the smooth lower surface will always be downward, a feature especially necessary when bow or sliding trolleys are used. The short distance between hangers also prevents the end of a broken trolley wire from coming dangerously near the ground.

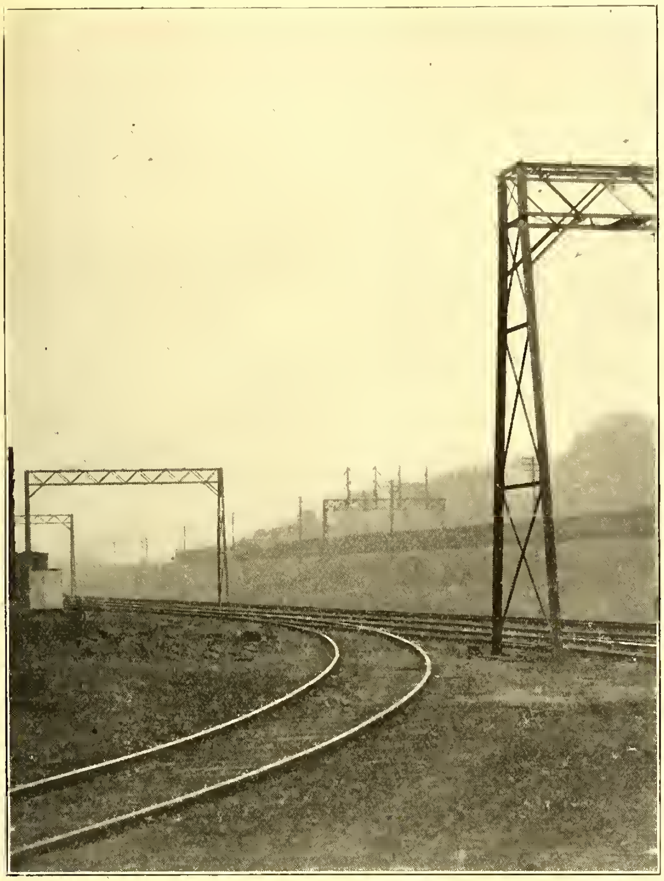


FIG. 11.—DOUBLE CATENARY BRIDGE CONSTRUCTION

The method of supporting the messenger below the bracket arm enables a tension rod to be attached to the outer end of the bracket without the necessity of fishing the messenger cable over the arm and under the brace. The cable and trolley may be run out along the track and pulled up in place under the brackets with a minimum amount of labor. Another advantage in this arrangement is the slightly flexible character of the point of support of the messenger; this is not sufficient to permit any considerable vibration of the span as a whole, but will allow any small vibration set up by the trolley to pass on. It has been noticed in rigidly supported spans of considerable length that a tendency exists for waves to be reflected from these fixed points which, when they reach the trolley, lift the wire from it, thereby causing flashing.

The hanger is illustrated in Fig. 3, and consists of a galvanized malleable-iron casting made in ten lengths. It is fitted with a bolted clamp to take the messenger cable, and is secured to the trolley with screws. At intervals of about 1000 ft. and upon curves of large radius, a steadying device, shown in Fig. 1, is used. The pull-off used on sharp curves, the method of anchoring and the section-break insulator are shown in Figs. 4, 5, 6, 7 and 8.

MEASUREMENTS ON SPANS IN SERVICE

A road 5 miles in length has been in operation for about five months, and upon this road several forms of construction have been installed. One portion has been equipped with 120-ft. spans with sags of 24 ins. in the messenger cable. Another section has spans of about 96 ft. and sags of about 4 ins. In the latter case both messenger and trolley wire are tighter than the former. The effects of temperature upon these two forms of construction are indicated by the following observations during a period of two months:

Date	Temperature Fahr.	Height of Trolley Wire Above Rails	
		Span No. 1	Span No. 2
		120-ft.	span
12–22–04	33.8°	21 ft. 3.4 in.	21 ft. 5.1 in.
12–23–04	52.3°	21 " 2.0 "	21 " 3.6 "
1– 4–05	16.0°	21 " 4.1 "	21 " 5.5 "
		96-ft.	span
12–22–04	34.7°	20 ft. 7.0 in.	20 ft. 7.5 in.
12–23–04	52.3°	20 " 6.8 "	20 " 7.4 "
1– 4–05	14.7°	20 " 7.4 "	20 " 7.9 "

The greatest temperature variation noted on the 120-ft. spans was 36.3 degs. F., and the corresponding changes in height at the centers of the spans were 2.1 ins. and 1.9 ins., respectively. For the 96-ft. spans the temperature variation was 37.6 degs., and the corresponding changes in height were 0.6 in. and 0.5 in., respectively.

The combined weight of messenger, 000 trolley wire and hangers averages 1 lb. per foot, which gives a tension in the messenger cable with 120-ft. span and 24-in. sag of about 900 lbs. The tension with 96-ft. span and 4-in. sag is about 3500 lbs.

BEST ARRANGEMENT

For best results with this form of construction, both as regards cost and operation, the following arrangement is considered satisfactory: The spans should be 120 ft. long on straight track, reducing the length as may be necessary on curves. The messenger to consist of a 0.4375-in. galvanized Bessemer steel cable composed of seven strands and having an ultimate strength of about 6000 lbs. The trolley wire to be 000 grooved section supported in horizontal position by hangers placed 10 ft. apart. The messenger cable is to be pulled up to a minimum

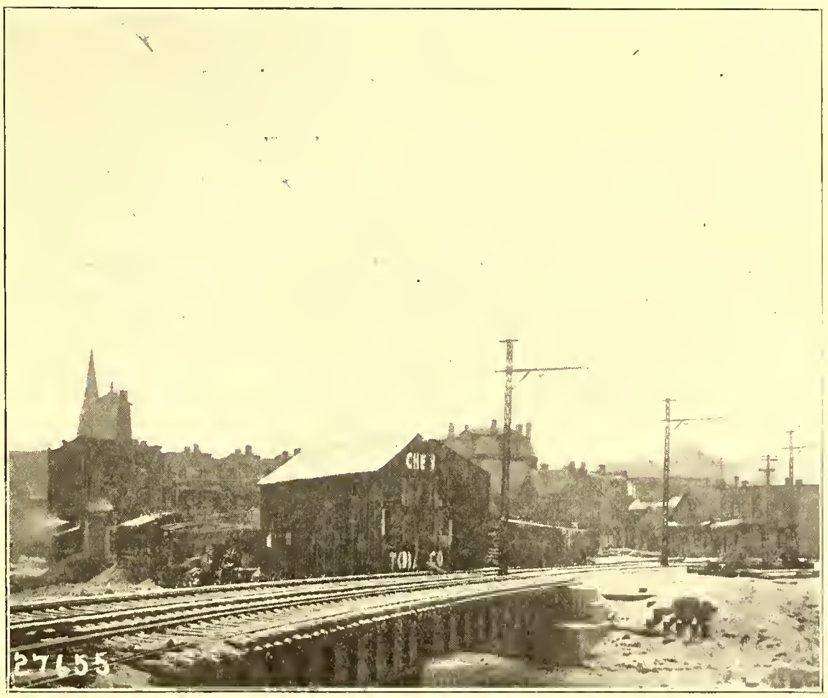


FIG. 12.—DOUBLE CATENARY, CURVE WITH PULL-OFF

cold-weather sag of about 11 ins., corresponding to a tension of about 2000 lbs.

CROSS-SPAN CONSTRUCTION

For conditions where bracket arms cannot be used, cross-span work may sometimes be employed. For this purpose the arrangement indicated in Figs. 9 and 10 has been designed. The difference between this arrangement and the bracket-arm construction is the substitution of a 0.4375-in. steel span cable for the bracket. Other details are practically the same.

BRIDGE CONSTRUCTION

For the heavy service requirements of steam roads having from two to four tracks, the construction described above is not adequate; a more substantial equipment and one which will not encroach upon the present standard clearances is necessary. Obviously, the best form of support to accomplish this result is a bridge long enough to span all tracks with ample clearance on the sides and overhead and stiff enough to carry all of the overhead conductors without undue vibration. Bridges of this character are at present in use on many roads to support semaphores and other signal apparatus.

Fig. 11 illustrates a section 2500 ft. long of a three-track road, one track of which has been equipped with the bridge construction. The double-catenary system is used, each messenger being a 0.4375-in. steel stranded cable. The trolley wire is 000 grooved, and the supporting hangers are placed 10 ft. apart. The average total weight per foot supported by each cable, including its own weight, is 0.91 lbs. The vertical sag in the first span, which is 230 ft. long, is 2.6 ft., and in the second span, which is 270 ft. long, 3.6 ft., both at 26.6 degs. F. The corresponding tension in the messenger cables is 2300 lbs.

The observed variation in height of trolley wire due to temperature change was as follows:

Date	Temperature Fahr.	Height of Trolley Wire Above Rails	
		Span No. 1	Span No. 2
1-16-05	20.6°	23 ft. 9.1 in.	23 ft. 7.1 in.
1-26-05	6.8°	23 " 10.1 "	23 " 9.9 "
2- 9-05	39.2°	23 " 7.3 "	23 " 4.3 "

The maximum temperature variation is 32.4 degs., and the corresponding change in height of trolley wire is 2.8 ins. for the 230-ft. span and 5.6 ins. for the 270-ft. span. Fig. 12 represents a curve of 425-ft. radius. In this view the use of double-catenary curve pull-offs is illustrated.

PROPOSED GENERAL PLAN

It was first thought advisable to run the messenger cable over the bridges. Fig. 11 shows this construction. It is necessary, however, to provide an unobstructed view of the signal apparatus, and it is accordingly considered preferable to make the bridge high enough to permit the semaphores to be suspended below the truss.

Fig. 13 indicates a signal bridge which has been devised for a four-track road carrying, beside the semaphores, the four sets of cables and trolley wires suspended below the truss. This construction is a decided advantage in erecting, as the cable and trolley wire can be run out along the track and lifted into place. Massive porcelain insulators will be used mounted on heavy pipe and fitted with collars having soft lead strips under them. From these the cables will be hung by means of bolted clamps. By anchoring all cables to the bridges after being drawn up to a uniform tension, the effect will be to steady the bridges. For roads having wide rights of way comparatively light bridges steadied with guy cables may be used, but for most cases a substantial structure similar to those now used for signal towers will probably be preferable. It will be noted, however, that owing to the comparatively long intervals between signals only a few of the bridges carry semaphores; the others may be made lighter than the one indicated in Fig. 13.

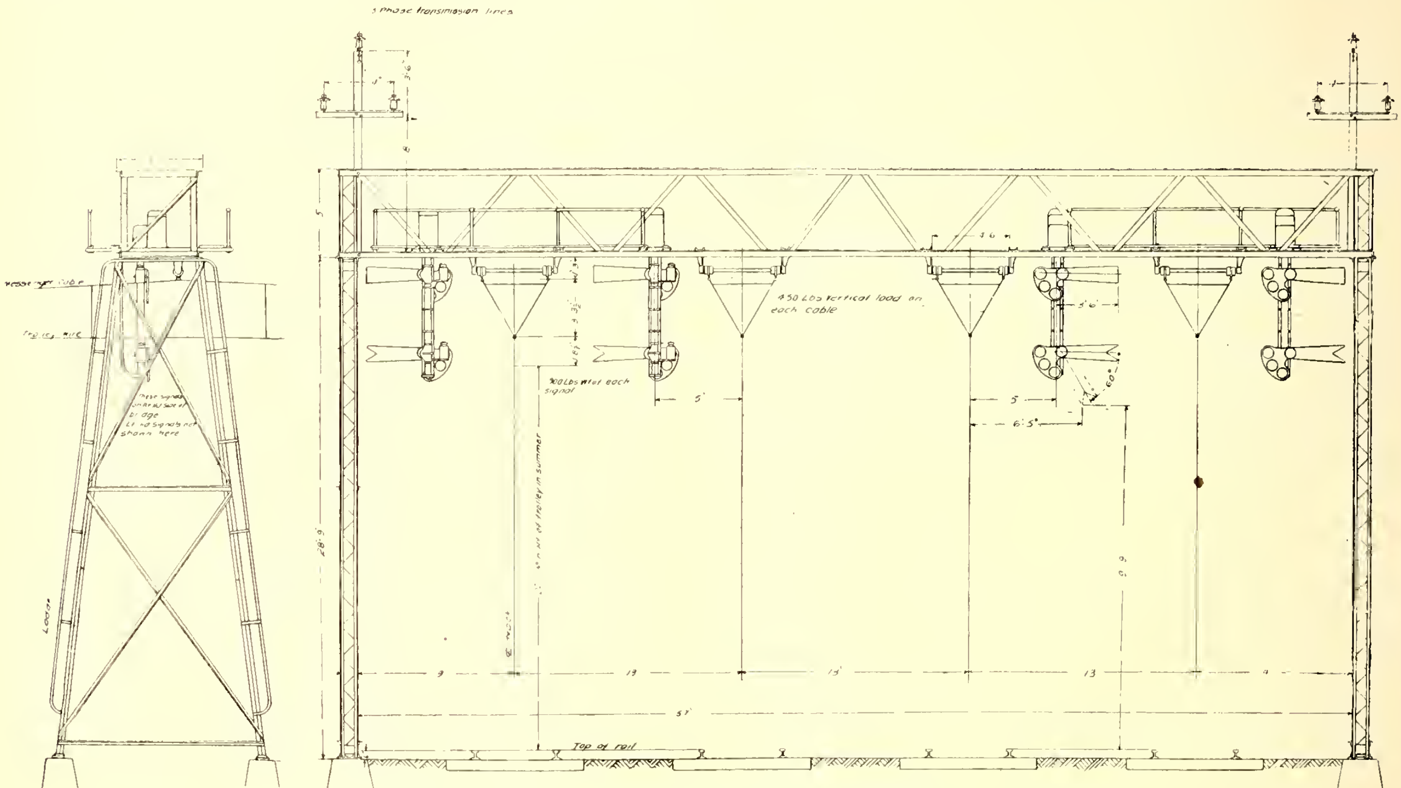


FIG. 13.—SIGNAL BRIDGE DEVISED FOR A FOUR-TRACK ROAD

Spans of 300 ft. for straight tracks appear to be satisfactory, not being so long as to permit undue vibration in the cables, and not so short as to require a large number of bridges per mile.

For the messenger cables 0.625-in. extra high strength steel strands are suitable. With a 0000 grooved trolley wire and hangers spaced 10 ft., the average load per foot on each cable is 1.43 lbs., and with a vertical sag of 2.7 ft. the tension is 6000 lbs. In a rough climate, wind and sleet will at times increase this tension; assuming that the tension may be doubled, a factor of safety of about 3.5 will still remain, as the breaking strength of the cable is about 40,000 lbs.

For use in localities where milder weather conditions may be assumed, lower grades of steel may be used, having breaking strengths for the same weight per foot of 25,000 lbs. and 19,000

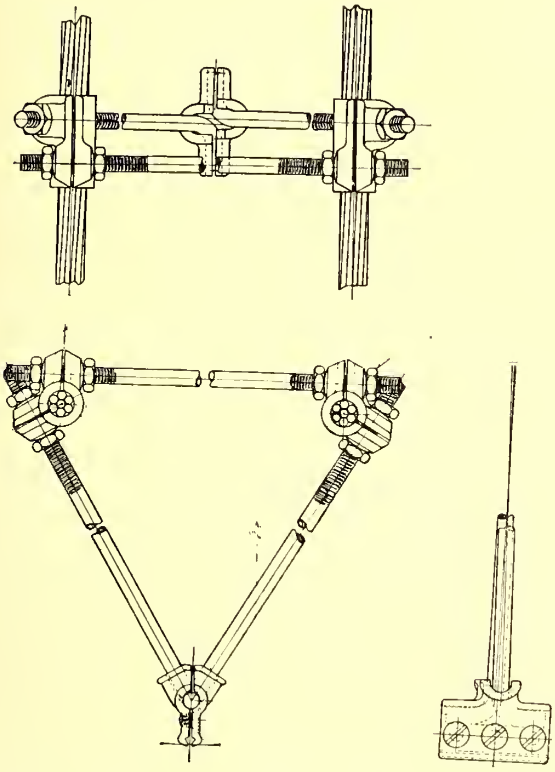


FIG. 14.—DOUBLE CATENARY, ADJUSTABLE TROLLEY HANGER

lbs. These latter cables are somewhat easier to handle and would be sufficiently strong for most conditions.

The sag given above is taken to be the cold weather condition, and for 100-deg. F. rise the sag would be about 4.4 ft., or a variation of 1.7 ft. In Fig. 13 this allowance is made in the

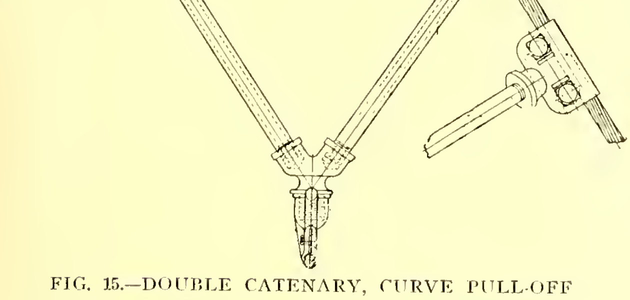


FIG. 15.—DOUBLE CATENARY, CURVE PULL-OFF

height of the bridge so that the lowest point of the trolley wire will be 22 ft. above the track. It is not believed that the variation will be this much on account of the giving of the supports and other causes.

For curves the length of span will be decreased, and when necessary to hold the wire in the center of the track radial pull-offs will be used, secured to strain insulators. These will be mounted on latticed poles, which in turn will be braced by guy anchors.

For sharp curves the radial pull of all the messenger cables would be severe, and it is intended to provide at the tangent points anchor bridges which will have trusses stiff enough in the horizontal plane to stand the strain of slacking off the cables about one-half. These anchor bridges will then be held by long guys running out a considerable distance from the bases of the bridges and anchored to cross-ties or channel irons buried in the ground and concreted.

Several details for the double-catenary construction are shown in Figs. 14 and 15. All of the metal parts other than the bridges and trolley wire are galvanized, but as a further protection against depreciation from locomotive fumes periodical painting is advisable.

Regarding the efficiency of the insulation employed, it may be stated that under snow-clad conditions 2500 ft. of iron bridge work and 5 miles of single-catenary construction showed under test a leakage of 1 amp. at 6000 volts.

CONCLUSION

The foregoing describes the actual work which has been carried out with the view of developing a system of overhead conductors for moderate and heavy traction service which will approach in a far greater degree than heretofore the reliability and permanency of present steam railroad equipments.

Aside from the work described above, 40 miles of road using the single-catenary wood-pole construction have been put in operation in Indiana. This has been in successful running order since the first of this year. The remaining 60 miles of this road will probably be completed in the near future. The pressure is 3300 volts.

DISCUSSION ON BOTH PAPERS

F. N. Waterman, in opening the discussion, gave some particulars of European alternating-current practice. He said that the longest experience with the problem of conveying energy at high tension to a moving vehicle has been that of the Ganz Company, which has now extended over about five years. This has all been with three-phase current at 3000 volts and low frequency, and there have, therefore, been two trolley wires. The preliminary trials on the experimental line at Buda-Pest lasted for something over a year, and the system has been operated in Italy altogether nearly four years, of which two and a half years has been in actual practical service. The original line erected in Buda-Pest, while differing in detail, was not essentially altered in the actual construction employed on the Valtellina line. During the experimentation at Buda-Pest both single and double-catenary suspension were tried, the construction being essentially similar to that used on the Spindlersfeld line. The cross-suspension type, however, was adopted, the system of double insulators and double supports, shown in Mr. Damon's paper, being used. A considerable sag is allowed in span wires, and every effort is made to give an elastic and uniform suspension. The insulators as installed are extremely heavy and certainly do not aid in securing this result. Dry wood, impregnated as suggested by Mr. Damon, forms an important feature both of the old and new construction.

For long spans and at switches an arrangement similar to the first diagram in the accompanying abstract in Mr. Damon's paper, showing cross suspension, is employed, and a very interesting special type of span-wire construction is also used, particularly where the trolley wires are lowered to pass under bridges, and hence undue rise and fall with the passage of the trolley would be undesirable. This consists of a catenary type of cross suspension connected at intervals by suspension wires with an upwardly arched span wire which carries the insulators, thus making a construction which does not sacrifice the substantial elasticity of the line, but holds it accurately in place, permitting a limited rise and fall with the passage of the trolley.

During the experimental period some difficulty was experienced with the overhead construction, and in one or two cases the wire broke, but the chief difficulty was encountered in the tunnels, and was both mechanical and electrical in its nature, since the accumulation of deposits from the steam locomotives continually running through the tunnels during the experimental period and the leakage of tunnel roofs caused insulation troubles, while owing to the very small clearance of the tunnels, difficulty was experienced in keeping the wire from grounding between supports. This was overcome by shortening the distance between supports and weighting the conductors by clamping small iron rails upon them, these being put on in sections several feet in length in the same manner as a mechanical clip. Although the construction is not by any means heavy, and the workmanship shows the effect of inexperience on the part of the linemen, it has successfully withstood the wear and tear of use, and so far as the speaker had been able to learn has never been pulled down. In one or two instances at the beginning of the experimental operation, the trolley caught in the suspension wire owing to the improper location of curves and turn-outs, but the result was to break some portion of the trolley mechanism and leave the line in condition for use.

For their newest construction the double-catenary type is used, no span-wire supports whatever being employed, and two messenger wires serving to carry both contact conductors. The spacing of the conductors is maintained by wooden insulator bars upon which the insulators proper are carried, and to which supports from the messenger wires are attached. The insulators have been very much lightened by the substitution of pressed steel for malleable-iron castings. The messenger wires are carried on iron girders, spanning the track, the distance between girders being 130 ft., and the distance between points of attachment to the wire, 65 ft., there being two supports between girders and none immediately under them.

The block and signal system is interconnected directly with the contact conductors, and the entrance of a train onto a section in face of a danger signal disconnects the section, but the speaker was unable to learn the details of the system. In addition to this, the conductors within the limits of the stations, and for a definite distance on each side, are dead at all times, save when a train is actually approaching or starting from a station. These sections can only be thrown in by the signal operator. It is customary for express trains to coast over with trolleys down, and it is the usual practice for trains moving at full speed to lower the trolleys at all switches, except such trains as are off from schedule and are making up time.

The feature of double insulation, which is used throughout, has proved particularly useful in rendering possible the breakage of a single insulator without causing interference with traffic until repairs can be effected. This feature, while of course not a novelty, seems particularly worthy of perpetuation in high-tension lines where special liability to mechanical break-down exists. The idea of cutting out sections at stations and the extension of the same idea carried out on the Spindlersfeld line, of cutting out sections under bridges where the right of way passes under highways, seem also worthy of consideration, at least for special cases.

The Valtellina system seems to have been free from trouble with the overhead construction to a remarkable extent, notwithstanding the fact that two overhead wires are required, and this fact emphasizes the importance of using a trolley contact device which cannot get off from the wire, and thus either break insulators or pull down the construction.

The trolley itself is a single apparatus and not two independent devices. It requires, however, two separate bases and poles, as would be the case were there two single trolleys. The outer ends of the two poles are connected by a continuous bar of impregnated wood, the center portion of which for a distance of about 8 ins. is the full diameter of the rolling contacts. On either side the diameter is reduced to receive two contact cylinders which are slipped over and supported on insulated ball bearings, the current being taken off by carbon contact rings at the ends and carried by flexible jumpers to the trolley poles. The cross bar with its contact rollers is flexibly connected to the ends of the arms by horizontal spiral springs, permitting simultaneous contact with the two wires, even where they are at widely different heights.

The rollers originally put out were of copper and gave trouble by elongation under the hammering of service, and so binding the bearings. Ganz & Company now send out steel rollers copper plated, and claim a wear of 10,000 km per roller, or 20,000 km per vehicle, before replating becomes necessary. The copper rollers gave a life of 30,000 km to 40,000 km per vehicle, but then had to be entirely renewed. The operating company prefers bronze, and finds no trouble from elongation.

The trolley poles are supported by spiral springs in tension, the tension being put on from within the vehicle by compressed air. With this device the slow-moving trains take 300 amps. without sparking or burning the wire. The normal speed of passenger trains is 40 m.p.h., and the maximum current that has been taken at that speed is about 240 amps., at which the collectors worked satisfactorily. The highest speed at which the device has been tested is 62 m.p.h., taking off a current of about 100 amps. This test was made without alteration of springs or line construction, and gave entirely satisfactory results.

The plan of construction employed has therefore demonstrated its effectiveness at moderate speeds, in spite of the handicap of the extreme weight of the insulators. After two years of use the trolley wires show practically no wear, nor evidence of burning. Very little sparking is evident at night when running at full speed, but, as would naturally be expected, such flashing as does occur takes place at the points of suspension. The type of trolley used seems therefore to combine the advantages of the wheel and bow forms. It cannot leave the wire, and as at present constructed cannot catch. The rolling contact practically eliminates the wear on the wire and contact conductors. The only serious objection to the overhead construction raised by the local engineer was to the location of the wires over the track, necessitating much of the work to be done at night, or else conducted under serious disadvantages.

During the entire period of operation no one has either been killed or injured by contact with the overhead construction, but an engineer of the Ganz Company was killed in one of the sub-stations.

The organization for the maintenance of overhead construction is very interesting. The line is 66 miles long, and for the purpose of controlling is divided into five sections, for each of which five men are kept. Their duties include patrolling of the line and visiting the sub-stations at regular intervals. When not otherwise engaged, one man is always on duty at the sub-stations. In general charge of all sections is a superintendent, who reports to the electrical engineer.

The total cost of maintenance of primary and secondary lines, care, attendance and maintenance of sub-stations and patrolling of line on this plan is about $102 per mile per annum. This force is not kept fully occupied, but it is held that no smaller force would be allowable. The engineers of the operating company and of the Rete Adriatica seem to agree that the exigencies of mail line railway service demand that a sufficient force should be maintained to insure the prompt resumption of service in case of accident, and that the cost of maintenance and repairs and of the supervision of sub-stations is not determined by the actual labor involved, but by the necessity for prompt action in emergencies. The difference in cost of maintenance between a three-phase and a single-phase line on main line railways is therefore, according to this view, simply the difference in the cost of material, and hence a negligibly small quantity. The point of view is interesting, and so far as the speaker knew has not been mentioned in just this form in this country, but in view of the higher cost of labor here, it is questionable how far the plan could be adopted.

Mr. Townley pointed out that hitherto overhead trolley construction had followed along the original lines, and that the improvements made have been those of details. The departures indicated in the two papers of the evening were therefore extremely important, but we should observe a considerable degree of caution in recommending extremely high voltages right away. It is one thing to construct 10,000-volt systems in the open country and another to recommend a high-tension trolley system for general service through closely populated centers. We can, of course, provide safeguards in the way of grounds, etc., but there is a wide difference in doing this for 500 volts than for 2000 volts, 3000 volts, 6000 volts or 10,000 volts. The difficulty of maintaining the insulation and keeping the passengers out of danger should not be lost sight of. He did not agree with Mr. Damon's recommendations that now was the time to standardize the pressure or location of the wire. He believed that was the very thing we do not want to do at present. We have not had enough evidence of satisfactory operation on any of these lines to attempt standardizing without danger of making serious mistakes. He considered of interest the data presented by Mr. Waterman on the rolling contact system, which brought to his mind the remarks made by Mr. Potter at a recent meeting of the New York Railroad Club, to the effect that some of the European contact devices had failed on this side owing to higher speeds and greater currents. Mr. Damon also suggests the possibility of greasing the trolley wire to prevent sleet, but he thought it would be difficult to provide a sufficient number of men to grease the trolley wire before sleet forms. Mr. Damon's suggestion of the use of 15,000 volts on steam roads introduces at once the query of how far it would be desirable to go in raising the trolley potential. It was not clear to him that 15,000 volts would be more economical either in first cost or operation. The additional expense for insulation would prove considerable, and for any distances thus far contemplated, he was inclined to think that a lower voltage would prove cheaper.

Mr. Armstrong, the next speaker, said he believed absolutely in keeping the trolley potential as low as can be done to do the work. We do not need to go higher than 3000 volts. Greater pressures would involve increased cost, danger, liability of break-down and otherwise unnecessary expenses. The catenary type of construction is adapted for potentials as high as 15,000 volts, but the advisability of using this voltage simply because it is possible is another question. Looking at this matter in another way, it is possible at 3000 volts to operate cars of 40 tons to 50 tons at a speed of 50 m.p.h. on half-hour headway, with sub-stations spaced 20 miles apart. It was a question as to how much trolley wire should be out of service in case of an accident, and it seemed to him that 20-mile blocks were surely long enough, if not too long, for economical operation. To have a higher trolley potential for the sake of permitting greater spacing of sub-stations is an undue refinement not called for by operating conditions. When one comes to heavy freight trains with 1500-hp motors it is time to consider higher potentials, but even in such cases 5000 volts or 6000 volts would take care of all conditions involving not only sub-stations, but the line drops, cost of apparatus and all the operating conditions would be perfectly satisfactory. The position of the trolley has been alluded to. At the present time there are three high-tension lines in operation, two having the trolley suspended over the center of the track and one at the side. It seemed to him that there are arguments in favor of both locations. The center trolley permits the use of the trolley wheel or bow for both city and suburban service. Many of our city systems, however, are so constructed that a bow cannot be used so that a separate trolley wheel will have to be employed for mixed systems. It is doubtful if suspending the trolley in the center would effect any economy in the trolley wheels required. The side-suspended trolley opens another advantage. It necessitates the use of a separate bow or trolley wheel for the high-tension part of the line, which has some advantages in safety of operation and also in the facility for changing over. The operation of both styles of suspension will be watched with interest. We are not yet in position to standardize one or the other. The frequency of hangers between the supporting cable is another point for study. Mr. Damon also suggests the use of separate transmission lines to each sub-station as being an improvement over a single set of wires from the power station serving all the sub-stations in multiple. From his company's experience, Mr. Armstrong was led to believe that the trouble with transmission lines increased with their mileage. While it gives a certain concentration of labor in the generating station it brings up the specious idea of eliminating the sub-station attendance. He wanted to suggest to Mr. Damon that on further operation of the road in question it may be found advisable to have a sub-station attendant even if there is no moving machinery. While he would not have to be on hand constantly, still it would be advisable to have a man near a telltale device to cut switches and transformers in or out, etc. In conclusion, he hoped that at some future meetings papers would be presented stating the conclusions of experience in this work rather than what seemed to be the proper idea.

The next speaker was Mr. Babcock, consulting engineer of the Southern Pacific Railroad. He said that in the West conditions were such that the first and third classes (moderate speed, inexpensive lines for country districts and electrification of steam railroads) mentioned in Mr. Damon's paper were the ones which would be encountered first, namely, comparatively inexpensive lines running through sparsely settled territory, with freight traffic forming the greater part of the earnings, and steam road work. Steam railroad men were exceedingly conservative on this subject. The question of line protection and insulation was a very vital one, especially on the Pacific Coast. It has been found that high-potential transmission lines can be operated in the interior and southern parts of California with comparatively little insulation, but in those sections where fogs are frequent, conditions are entirely different. As to operating above 3000 volts or 6000 volts, it becomes a question not only whether it is worth while, but how about leakage? The construction details presented in Mr. Varney's paper give a most beautiful line, but if the leakage he gives is to be carried out throughout the line in bad weather it is questionable how far one would get with this type. In one table Mr. Varney states there was a leakage of 6 kw on 5 miles of single-catenary construction. On 40 miles of double track this would mean a constant loss of 96 kw. In 500-volt work the constant losses are small, the greater losses occurring while the cars are moving. Consequently the higher voltage would also give losses while the car is moving. As to insulators, it was his personal opinion that porcelain was the wrong material for overhead construction. With regard to the location of the trolley wire, from the steam railroad man's standpoint, great difficulties must be overcome in arriving at the proper clearances through densely crowded tunnels, snow sheds, bridges, etc. Referring to Mr. Damon's suggestion that high-tension lines should be carried around towns to insure the public safety, he remarked that 60,000-volt transmission lines in California were carried right through the towns. As to grounding, he said that when one of the low frequency circuits was grounded all the telephone bells in the district were set ringing, disorganizing the telephone service for miles around.

Prof. Sheldon then read a long letter from Mr. Mailloux in which the writer called attention to the necessity of studying methods for the efficient and convenient transmission of electrical energy in large quantities. He mentioned also his visit to Europe for the purpose of examining the high-tension lines there in use, saying that what he saw there, especially on the Spindlersfeld line, made him a firm believer in high-tension railways. He favored 6000 volts for a standard on interurban lines as against 3000 volts, and thought at least 15,000 volts desirable for steam roads. He said that, mainly on account of municipal restrictions, the projected European single-phase lines would operate on 2400 volts. He believed that the double catenary for keeping the wire from swinging probably will not justify the increased cost. As to current collection, it was his opinion that contact from above, like the Huber system, is better. Further details, with illustrations of late improvements in the Huber system, will be given by Mr. Mailloux in an early issue.

Mr. Hammer made a few remarks relative to his trip two years ago to inspect the Valtellina line in Italy, which he described in a lecture given before the Franklin Institute, and which was published in the STREET RAILWAY JOURNAL of May 2, 1903.

Mr. Varney, on taking the floor, said in reply to Mr. Babcock's criticisms on leakage, that the leakage mentioned in his paper occurred while the entire line was covered with wet snow. Another day when the line was comparatively clear from snow, but still coated with smoke, the leakage could hardly be detected.

Prof. Sever referred to the last paragraph in Mr. Damon's paper, in which the suggestion is made that on interurban roads the trolley wire should be 20 ft. above the center of the track, and that for steam road electrification the height of the contact wire at the side of the track could be made standard at 16 ft. As Mr. Babcock said, steam railroad men guard their standard heights most rigorously. He instanced the New York, New Haven & Hartford Railroad, which keeps a constant watch at a crossing in Bridgeport, Conn., to see that the trolley wire of the electric railway at that point is never less than 21 ft. above the track. If in steam railroad practice any such distance as that is absolutely required then a considerable change will have to be made in the erection of the proposed overhead work. Furthermore, from a safety to life standpoint, it seemed to him that a trolley wire of 15,000 volts running under bridges and other accessible places with small clearance would prove very dangerous, particularly to the inquisitive small boy. The fire hazard must also be seriously considered in passing through populated centers. He indorsed strongly Mr. Armstrong's position on the use of a trunk line serving the sub-stations in multiple and on spacing the sub-stations closer than suggested by Mr. Damon.

MANCHESTER (ENG.) TRAMWAYS ADOPTS SCALE OF CHARGES FOR PARCELS

The Manchester (England) street railway committee has adopted a scale of charges for parcels, inclusive of the charge for delivery, for two areas, the "inside" and the "outside." The "inside" area includes the whole of the city of Manchester, the borough of Salford, and the township of Stretford as far as Warwick Road. The "outside" area includes the suburbs which are around the district thus outlined and within the tramway's circuit. Parcels are delivered to all parts covered by the scheme at intervals of not more than a quarter of an hour. The following are the charges for the two areas: Not exceeding 14 lbs., 4 cents inside, 6 cents outside; not exceeding 28 lbs., 6 cents and 8 cents; not exceeding 56 lbs., 8 cents and 12 cents; not exceeding 112 lbs., 12 cents and 16 cents. Manchester, with Salford and Stretford, all included in the "inside" area, has a population of about 800,000 people. The "outside" area includes a number of suburban towns and villages.

CENSUS REPORT ON STREET RAILWAYS—II. CAPITALIZATION AND FINANCIAL RESULTS OF OPERATION

In the last issue a summary was given of the contents of the first three chapters of the extensive report on street railways for 1902 just published by the Census Bureau of the Department of Commerce and Labor. Chapter IV. of the report is devoted to capitalization, and discusses first some of the difficulties of determining the net amount of capital liabilities issued per mile of track, owing to the ownership of securities of one company by another, also to the common operation of lighting plants by railway companies. To overcome the former trouble, the census officials have deducted the value of the securities so held from the total amount, and in the case of ownership of lighting plants have indicated this fact by a foot note. Numerous statistics are given on this subject from which the following table has been derived, showing the net capital liabilities per mile of track of full-time electric railway companies, without commercial lighting:

TABLE SHOWING DISTRIBUTION OF FULL-TIME ELECTRIC SURFACE RAILWAY COMPANIES, WITHOUT COMMERCIAL LIGHTING, IN THE SEVERAL URBAN AND INTERURBAN GROUPS, ACCORDING TO CAPITALIZATION PER MILE OF TRACK: 1902*

NET CAPITAL LIABILITIES PER MILE OF TRACK	Number of Companies						
		Urban Centers, Population				Interurban Railways	
	Total	500,000 and Over	100,000 but Under 500,000	25,000 but Under 100,000	Under 25,000	Fast, Long	Other
Under $25,000	196	5	2	13	80	4	92
$25,000, but under $50,000	184	8	2	26	60	22	66
$50,000, but under $75,000	87	9	7	16	20	9	26
$75,000, but under $100,000	35	6	5	5	5	3	11
$100,000, but under $150,000	35	2	18	6	2	2	5
$150,000, but under $200,000	10	6	1	....	1	....	2
$200,000, but under $300,000	10	8	1	1	....	....	....
$300,000 and over	9	4	1	2	1	....	1
Totals	566	48	37	69	169	40	203

* Exclusive of reports for 6 companies which failed to furnish this information.

The report points out that various causes have tended to make the cost of ordinary overhead trolley railways higher in centers of more than 500,000 population than elsewhere. The traffic is much heavier per mile of track than in smaller places, and the road must, therefore, be equipped with more cars; the expense for power houses and for car houses is much greater per unit of track than in cities where the traffic is less dense; the track, being subjected to more severe strain than elsewhere, is in general more expensively constructed, with deeper and stronger foundations and heavier rails, and the cost of paving is likewise greater.

Perhaps the most important factor tending to increase the amount of capital expended in street railway construction in the great centers of population is the fact that there, more than anywhere else, public demand has compelled speedy adoption of improvements in methods, resulting in extensive reconstruction and replacement. It was mostly in the larger cities that horse railways were developed and abandoned. It was chiefly there, too, that cable traction superseded horse traction, only to be itself soon displaced in most instances by electricity. Changes in methods of operation in these cities have had, in many cases, to be accomplished without the interruption of traffic, thus increasing the cost of reconstruction.

As the expense of constructing street railways has been greater in centers of more than 500,000 population than in those of any other class, so, doubtless, railways in centers of from 100,000 to 500,000 inhabitants have cost more than those in the centers of the next smaller size, and the latter in turn more than railways in the smallest urban centers. Whether these variations in cost are sufficient to explain altogether the wide differences in the ratio of capitalization to trackage is a question that can not be fully discussed in this report. It may be observed, however, that the temptation to overcapitalize is stronger in the great cities, for the margin of earnings over operating expenses is greater in such cities than elsewhere. In smaller cities, or on interurban railways, the profits of the business are frequently scarcely enough to pay interest on the bare cost of construction. Under such circumstances the issue of securities beyond that cost would find its motive almost solely in the hope of future increase in earning capacity.

FINANCIAL OPERATIONS

Chapter V. is devoted to this subject. Under general income account the following statistics as to percentage distribution of gross income for electric surface lines is given:

TABLE SHOWING PERCENTAGE DISTRIBUTION OF GROSS INCOME OF ELECTRIC SURFACE OPERATING COMPANIES: 1902

	Without Commercial Lighting	With Commercial Lighting	Part Time
Gross income	100.0	100.0	100.0
Operating expenses	57.3	57.3	58.1
Taxes	5.3	3.3	2.1
Interest, total	14.1	21.6	20.5
On funded debt	12.9	20.6	17.6
On other debt	1.2	1.0	2.9
Rental of leased lines	12.3	0.2	(*)
Miscellaneous deductions	0.2	1.7	(*)
Dividends	5.9	3.6	1.9
Surplus	4.9	12.3	17.4

* Less than one-tenth of 1 per cent.

This is followed by two tables, one showing the percentage distribution of gross income of all operating companies, the other of the surface electric railways without commercial lighting, both classified according to population:

TABLE SHOWING PERCENTAGE DISTRIBUTION OF GROSS INCOME OF OPERATING COMPANIES, CLASSIFIED ACCORDING TO POPULATION: 1902

	Total	Urban Centers, Population				Interurban Railways	
		500,000 and Over	100,000 but Under 500,000	25,000 but Under 100,000	Under 25,000	Fast, Long	Other
Gross income	100.0	100.0	100.0	1'0.0	100.0	100.0	100.0
Operating expenses	56.8	54.6	53.5	59.0	67.4	59.8	64.4
Taxes	5.2	6.3	5.1	3.6	2.8	2.4	4.2
Interest, total	15.2	11.9	17.1	16.5	16.2	26.8	20.1
On funded debt	14.1	11.1	16.2	15.3	14.3	25.1	17.6
On other debt	1.1	0.8	0.9	1.2	1.9	1.7	2.5
Rentals of leased lines	10.2	18.8	2.2	1.6	0.2	0 5	2.2
Miscellaneous deductions	0.4	0.1	0.7	0.5	0.3	1.1	0.7
Dividends	6.3	4.3	12.4	6.5	2.5	2.9	6.9
Surplus	5.9	4.0	9.0	12.3	10.6	6.5	1.5

TABLE SHOWING PERCENTAGE DISTRIBUTION OF GROSS INCOME OF FULL-TIME ELECTRIC SURFACE RAILWAY COMPANIES, WITHOUT COMMERCIAL LIGHTING, CLASSIFIED ACCORDING TO POPULATION: 1902

	Total	Urban Centers, Population				Interurban Railways	
		500,000 and Over	100,000 but Under 500,000	25,000 but Under 100,000	Under 25,000	Fast, Long	Other
Gross income	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Operating expenses	57.3	55.4	54.1	60.8	68.7	60.0	65.1
Taxes	5.3	6.0	5.3	3.8	2.9	2.5	4.4
Interest, total	14.1	10.6	16.9	13.9	15.6	27.4	19.1
On funded debt	12.9	9.8	16.0	12.7	13.5	25.6	16.5
On other debt	1.2	0.8	0.9	1.2	2.1	1.8	2.6
Rentals of leased lines	12.3	22.0	2.5	2.4	0.4	0.7	2.4
Miscellaneous deductions	0.2	0.1	0.1	0.7	0.3	0.5	0.7
Dividends	5.9	2.5	13.0	7.7	3.1	2.6	7.8
Surplus	4.9	3.4	8.1	10.7	9.0	6.3	0.5

The report calls attention to the fact that these full-time electric surface railways in centers of 500,000 and over show somewhat smaller proportionate payments for taxes, interest and dividends than do street railways as a whole, and that, on the other hand, they show a very much larger proportionate payment for rentals. These differences are largely due to the fact that the elevated railways, which are all within the largest urban centers and which are excluded from the latter table, make relatively large payments for taxes, interest and dividends, but do not operate any lines under lease, and hence reported no rentals. The electric railways having commercial lighting plants are, for the most part, in the two classes of urban centers of less than 100,000 inhabitants. Companies with lighting plants show a larger proportion of interest and a smaller proportion of dividends than companies without lighting plants. This is one explanation of the fact that in the last two urban groups the electric railway companies not furnishing commercial lighting show a smaller proportion of interest and a larger proportion of dividends than appear when all classes of companies are taken together.

The next table shows the ratio of taxes to gross income, and to income less operating expenses, in the more important States. It will be seen that Michigan, Ohio and Indiana are the only States in the table in which the taxes were less than 5 per cent of the gross income. The lower ratio of taxes in these States is probably due in part to the large proportion of interurban railways, the taxation upon which is as yet less heavy than that upon street railways in cities:

TABLE SHOWING PERCENTAGE OF TAXES TO INCOME, FOR STREET AND INTERURBAN RAILWAYS, IN SELECTED STATES: 1902

State	Percentage of Taxes to—	
	Gross Income	Gross Income, Less Operating Expenses
California	5.0	10.8
Connecticut	6.0	16.5
Illinois	5.9	13.6
Indiana	4.9	11.6
Kentucky	6.1	12.9
Louisiana	6.9	17.4
Maryland	8.2	15.6
Massachusetts	6.8	22.3
Michigan	3.5	8.0
Missouri	6.0	13.9
New Jersey	5.3	11.2
New York	5.6	12.6
Ohio	3.6	8.1
Pennsylvania	6.1	12.5
Tennessee	6.1	14.4

ANALYSIS OF OPERATING EXPENSES

Although statistics in regard to totals appear in elaboration in the census report, they are omitted largely from this abstract, partly because many of them appeared in the original report and partly because analyses of them are more useful. For this reason the statistics of the division of operating earnings are given above in percentage distribution only for all

TABLE SHOWING PERCENTAGE DISTRIBUTION, BY SOURCES, OF OPERATING EARNINGS OF FULL-TIME ELECTRIC SURFACE RAILWAY COMPANIES, WITHOUT COMMERCIAL LIGHTING, CLASSIFIED ACCORDING TO POPULATION: 1902

	Total	Urban Centers, Population				Interurban Railways	
		500,000 and Over	100,000 but Under 500,000	25,000 but Under 100,000	Under 25,000	Fast, Long	Other
Operating earnings	100.0	100.0	100.0	100.0	100.0	100.0	100.0
From passengers	97.0	97.9	97.7	96.4	94.6	91.2	95.1
From chartered cars	0.1	0.1	0.1	0.1	0.1	0.4	0.3
From freight, mail and express	0.8	0.2	0.5	0.7	1.0	5.6	1.8
From sale of electric current for light and power	0.6	0.4	0.3	1.0	2.2	0.2	1.2
From miscel'ous sources	1.5	1.4	1.4	1.8	2.1	2 6	1.6

full-time electric surface companies, without commercial lighting:

ANALYSIS OF OPERATING EXPENSES

The following table shows, for all companies, the percentage which each subdivision of operating expenses bears to the total operating expenses:

TABLE SHOWING PERCENTAGE DISTRIBUTION OF OPERATING EXPENSES OF OPERATING COMPANIES: 1902

ITEM OF EXPENSE	Percentage Total Operating Expenses
Maintenance of ways and structures, total	8.5
Track and roadway	5.7
Electric, cable, etc., lines	2.1
Buildings and fixtures	0.7
Maintenance of equipment, total	11.7
Steam plant	0.9
Electric, cable, etc., plant	0.6
Cars	5.4
Electric, cable, etc., equipment of cars	3.7
Miscellaneous	0.5
Miscellaneous shop expenses	0.6
Operation of power plant, total	16.2
Wages	3.2
Fuel	9.0
Water	0.5
Lubricants and waste	0.4
Miscellaneous supplies and expenses	0.4
Hired power	2.7
Operation of cars, total	43.9
Superintendence of transportation	1.8
Wages of conductors	16.9
Wages of motormen	17.3
Wages of other car service employees	1.8
Wages of car house employees	2.3
Car service supplies	1.3
Miscellaneous car service expenses	1.4
Cleaning and sanding track	0.5
Removal of snow and ice	0.6
Miscellaneous, total	18.1
Salaries of general officers	2.1
Salaries of clerks	1.6
Printing and stationery	0.3
Miscellaneous office expenses	0.5
Storeroom expenses	0.2
Stable expenses	1.0
Advertising and attractions	0.8
Miscellaneous general expenses	1.4
Damages	5.3
Legal expenses in connection with damages	1.3
Other legal expenses	0.7
Rent of land and buildings	0.4
Rent of track and terminals	1.0
Insurance	1.5
Wages, supplies and expenses incidental to electric service not elsewhere included	1.6
Aggregate	100.0

It will be seen from this table that almost one-fifth of the total operating expenses were devoted to the maintenance of way and equipment, while the operation of the power plant, of which cost of fuel is the most important item, required one-sixth of the total expenditure. A considerable number of street railways hire their electric current, either from other street railways, or, more often, from electric light companies, while, in a few instances, steam power is similarly hired. The aggregate expenditure for hired power in 1902 was about one-sixth of the expenditure of all companies for power. By far the most important class of expenditures is that designated as for "operation of cars," which amounted to 43.9 per cent of the total. The wages of conductors and motormen constituted more than one-third of the entire cost of street railway operation. The item "superintendence of transportation" cannot, in the case of some railways, be accurately separated from the item "salaries of general officers and clerks," but these instances are not of sufficient importance to affect materially the totals for the country.

A considerable part of the expenditure under the head "advertising and attractions" consists of the cost of maintaining parks and other places of amusement. The revenue derived by street railway companies from such enterprises has been deducted and the item therefore represents only net expenditure. The most important of the miscellaneous expenses is that for damages, mostly in personal injury cases. No less than $7,529,946 was paid by street railway companies for damages in 1902, while the legal expenses connected with claims and suits for damages raised the total expense to $9,395,545, which was one-fifteenth of the total operating expenses of all street railway companies.

The item "wages, supplies and expenses incident to electric service" was not reported in a uniform manner by all companies. It is intended to represent the expense peculiar to the production and distribution of electric current for light and power, as distinguished from expenses of the railway business proper. Some companies which sell light and power undertake to distinguish that part of their fuel and other power plant expenses, which is attributable to the lighting and power service, from that which is properly attributable to the railway operation. Other companies do not make such a segregation, but place under the last subdivision in the account only such expenses as are connected strictly with the distribution of current for light and power, excluding those due to its generation.

The percentage distribution of operating expenses of full-time electric surface railway companies, without commercial lighting, classified according to population, is shown in the accompanying table:

TABLE SHOWING PERCENTAGE DISTRIBUTION OF OPERATING EXPENSES OF FULL-TIME ELECTRIC SURFACE RAILWAY COMPANIES, WITHOUT COMMERCIAL LIGHTING, CLASSIFIED ACCORDING TO POPULATION: 1902

	Total	Urban Centers, Population				Interurban Railways	
		500,000 and Over	100,000 but Under 500,000	25,000 but Under 100,000	Under 25,000	Fast, Long	Other
Operating expenses, total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Maintenance of ways and structures	8.7	7.8	9.3	10.9	10.0	9.0	9.4
Maintenance of equipm't	12.2	13.2	10.7	10.9	10.8	13.3	11.7
Operation of power plant	15.4	13.2	14.0	16.2	22.7	22.6	20.6
Operation of cars	45.2	46.4	48.5	44.3	41.0	34.0	40.8
Miscellaneous	18.5	19.4	17.5	17.7	15.5	20.9	17.2
Wages, supplies and expenditures incidental to electric service, not elsewhere included	(*)	....	....	....	....	....	0.3

* Less than one-tenth of 1 per cent.

This table reveals considerable differences among the population groups in the distribution of operating expenses. The expense of maintaining ways and structures is relatively least in urban centers of more than 500,000 inhabitants, as might be expected from the small proportion of trackage in such centers to the total amount of traffic. For the same reason, on the other hand, the largest cities, in which, presumably, cars see more and harder service than in small towns, show a greater proportion of expenditure for maintenance of equipment than appears in any other group except the fast, long interurban railways, on which, by reason of the high speed maintained, cars are subjected to severe wear and tear. There is also a progressive increase in the proportion of expenses for the operation of power plant as we descend the scale of population of urban centers served. Other things being equal, the greater the density of traffic and the larger the scale on which the power plant is constructed, the lower will be the cost of power per unit of traffic. That the expense for the operation of cars, which consists chiefly of wages, is a smaller proportion of the total in urban centers of less than 100,000 inhabitants than in larger urban centers is due chiefly to the lower rates of wages paid in the smaller towns. The higher proportion of miscellaneous expenses in urban centers of more than 500,000 inhabitants as compared with the other urban groups is chiefly attributable to the heavier damage expenses in such cities.

Since peculiar interest attaches to the operations of street railways in large cities, the following has been prepared, which shows by percentages the distribution of operating expenses in detail for a group of seventeen selected companies, situated in ten of the largest urban centers in the United States. The companies included in the table are as follows: Boston Elevated Railway Company; Cleveland Electric Railway Company; Cleveland City Railway Company; Interurban Street Railway Company and Third Avenue Railroad Company, of New York; Brooklyn Rapid Transit Company; United Railways & Electric Company, of Baltimore; St. Louis Transit Company; Union Traction Company, of Philadelphia; Chicago City Railway Company; Chicago Union Traction Company; International Railway Company and Crosstown Street Railway Company, of Buffalo; Cincinnati Traction Company; United Railroads of San Francisco; Jersey City, Hoboken & Paterson Street Railway Company, and North Jersey Street Railway Company, of Jersey City, Newark and vicinity. The aggregate operating expenses of these seventeen companies were $56,-809,980, or about two-fifths of the total for the United States.

TABLE SHOWING PERCENTAGE DISTRIBUTION OF OPERATING EXPENSES FOR SEVENTEEN SELECTED ELECTRIC SURFACE RAILWAY COMPANIES IN THE LARGEST CITIES: 1902

Percentage of total operating expenses assignable to:	
Maintenance of ways and structures, total	8.1
Track and roadway	5.2
Electric, cable, etc., lines	2.2
Buildings and fixtures	0.7
Maintenance of equipment, total	12.8
Steam plant	0.9
Electric, cable, etc., plant	0.8
Cars	6.2
Electric, cable, etc., equipment of cars	3.8
Miscellaneous equipment	0.5
Miscellaneous shop equipment	0.6
Operation of power plant, total	12.7
Power plant wages	2.7
Fuel for power	7.2
Water for power	0.5
Lubricants and waste for power plant	0.2
Miscellaneous supplies and expenses of power plant	0.3
Hired power	1.8
Operation of cars, total	47.3
Superintendence of transportation	2.4
Wages of conductors	18.8
Wages of motormen	18.6
Wages of other car-service employees	2.1
Wages of car-house employees	2.2
Car-service supplies	0.9
Miscellaneous car-service expenses	1.3
Cleaning and sanding track	0.4
Removal of snow and ice	0.6
Miscellaneous expenses, total	19.1
Salaries of general officers	1.1
Salaries of clerks	1.4
Printing and stationery	0.3
Miscellaneous office expenses	0.4
Storeroom expenses	0.2
Stable expenses	1.4
Advertising and attractions	0.1
Miscellaneous general expenses	1.3
Damages	7.8
Legal expense in connection with damages	2.3
Other legal expenses	0.7
Rent of land and buildings	0.3
Rent of track and terminals	0.6
Insurance	1.2

A comparison of the distribution of expenses for these companies with that for all companies reveals a number of points of difference which are significant.

OPERATING RATIOS

Although operating ratios are somewhat misleading, the following table is given showing the distribution in the several urban and interurban groups. As the report points out, a low operating ratio is often regarded as an indication of good management, but this is not always the case. Thus a low operating ratio may mean higher fares, or less satisfactory service, or costly improvements, which materially lessen the expenses of transportation, but are not strictly profitable from the standpoint of the investor.

TABLE SHOWING DISTRIBUTION OF FULL-TIME ELECTRIC SURFACE RAILWAY COMPANIES WITHOUT COMMERCIAL LIGHTING IN THE SEVERAL URBAN AND INTERURBAN GROUPS, ACCORDING TO THEIR OPERATING RATIOS: 1902*

PERCENTAGE OF OPERATING EXPENSES TO OPERATING EARNINGS	Number of Companies						
		Urban Centers, Population				Interurban Railways	
	Total	500,000 and Over	100,000 but Under 500,000	25,000 but Under 100,000	Under 25,000	Fast, Long	Other
Under 50	43	5	6	4	6	6	16
50, but under 60	120	9	21	20	27	11	32
60, but under 70	159	11	6	27	48	12	55
70, but under 80	90	10	3	11	27	6	33
80, but under 90	64	4	....	1	27	2	30
90 and over	80	8	2	3	30	3	34
Totals	556	47	38	66	165	40	200

*Exclusive of reports for 16 companies which failed to furnish this information.

The next table shows the distribution of fare passengers in the same groups:

TABLE SHOWING DISTRIBUTION OF FULL-TIME ELECTRIC SURFACE RAILWAYS, WITHOUT COMMERCIAL LIGHTING, ACCORDING TO NUMBER OF FARE PASSENGERS CARRIED PER CAR-MILE AND ACCORDING TO OPERATING RATIO: 1902*

NUMBER OF FARE PASSENGERS CARRIED PER CAR MILE	Number of Companies Reporting Operating Ratio						
	Total	Under 50 Per Cent	50 Per Cent but Under 60 Per Cent	60 Per Cent but Under 70 Per Cent	70 Per Cent but Under 80 Per Cent	80 Per Cent but Under 90 Per Cent	90 Per Cent and Over
Under 2	64	4	4	8	10	8	30
2, but under 3	134	4	18	40	22	27	23
3, but under 4	164	5	43	54	29	19	14
4, but under 5	92	12	23	32	17	4	4
5, but under 6	38	6	18	6	3	2	3
6, but under 7	14	2	2	4	1	2	3
7 and over	8	2	2	2	2	..	..
Totals	514	35	110	146	84	62	77

* Exclusive of reports for two railways carrying freight only; for sixteen which failed to furnish this information, and for forty fast, long interurbans.

The following table gives the same division, but divided according to the number of passengers per mile of track:

TABLE SHOWING DISTRIBUTION OF FULL-TIME ELECTRIC SURFACE RAILWAYS, WITHOUT COMMERCIAL LIGHTING, ACCORDING TO NUMBER OF FARE PASSENGERS CARRIED PER MILE OF TRACK OPERATED, AND ACCORDING TO RATIO: 1902*

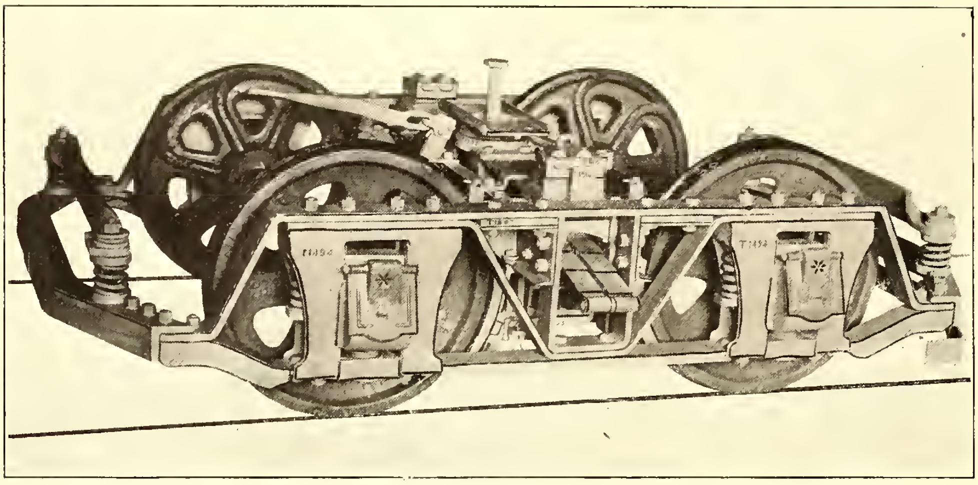
NUMBER OF FARE PASSENGERS CARRIED PER MILE OF TRACK OPERATED	Number of Companies Reporting Operating Ratio						
	Total	Under 50 Per Cent	50 Per Cent but Under 60 Per Cent	60 Per Cent but Under 70 Per Cent	70 Per Cent but Under 80 Per Cent	80 Per Cent but Under 90 Per Cent	90 Per Cent and Over
Under 25,000	54	5	3	7	12	6	21
25,000, but under 50,000	72	2	8	14	10	14	24
50,000, but under 100,000	177	6	30	53	32	33	23
100,000, but under 200,000	145	9	45	52	23	8	8
200,000, but under 300,000	34	5	11	11	6	..	1
300,000, but under 400,000	15	4	7	4	..	..	..
400,000 and over	17	4	5	6	1	1	..
Totals	514	35	109	147	84	62	77

* Exclusive of reports for two railways carrying freight only, for sixteen which failed to furnish this information, and for forty fast, long interurbans.

The Chicago & Alton Railroad does not propose complacently to permit competing electric railway to get its suburban passenger business. The company has been quietly at work planning for an interurban service over its lines, and now announces that on April 1 there will be put into effect a schedule that will compare favorably as regards frequency of service with any on the electric lines. For this service special cars with a seating capacity of 100 have been built at a cost of about $7,000 each. A feature of this equipment is the provision made for smokers, a compartment in each of the coaches being set apart for those who indulge. These cars will be coupled up as traffic demands, being run singly with a locomotive or in trains of two or more coaches. George J. Charlton, general passenger agent of the company, says that possibly in the future a gasoline motor coach may be used. The first of these new trains will be run between Dwight and Bloomington, a distance of 50 miles. On an average, stops will be about 2½ miles apart. The depot platforms are being remodeled to accommodate the interurban coaches, which will be equipped with drop steps. Rates of fare on the interurban trains will be the same as on the electric lines, about 2 cents a mile. Regular interurban mileage books of 100 coupons each will be issued. They will be good for bearer, and will be honored only on the interurban trains, not on regular local and through trains.

A NOVEL DESIGN OF HEAVY TRUCKS FOR SURFACE CARS

The new design of truck for electric railway car service, illustrated herewith, is of particular interest to railway mechanical departments for the many advantages offered for use under heavy cars in combined city and high-speed interurban service. On account of the short wheel base secured it is well



THE NEW SHORT WHEEL BASE TRUCK FOR HEAVY SERVICE IN BROOKLYN

adapted for congested city service, giving, it is claimed, equal if not better advantages than those of the maximum traction type of truck for city service; and, at the same time, the many other important features incorporated and the general conformity to the standards of the Master Car Builders' Association, render it unexcelled for high-speed service.

This truck was built by the Peckham Manufacturing Company, Kingston, N. Y., primarily for use under the large new semi-convertible type of car recently adopted by the Brooklyn Rapid Transit Company for its combined city and suburban service, as noted in the March 11 issue of this journal (page 466). The requirements of the service in Brooklyn are peculiar and perhaps more exacting than will be found in any other city. This design embodies a careful study of the conditions to be met, and will, it is thought, meet the requirements in the most successful manner. The principal features of the design are shown in the accompanying engraving.

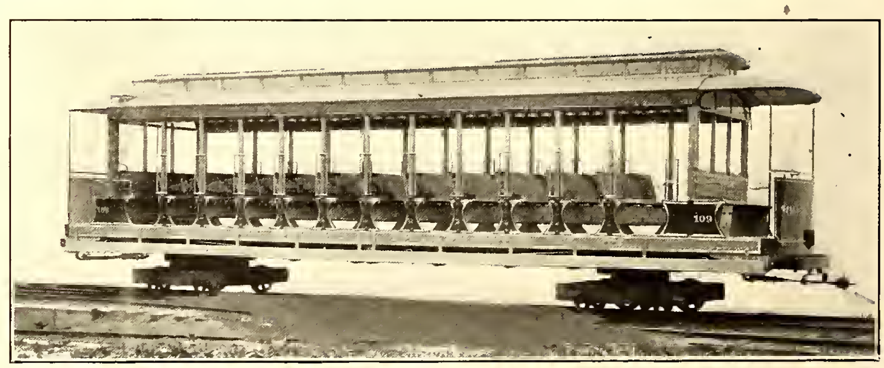
The new design secures a particularly short wheel base (4 ft. 10 ins.), embodying necessarily an arrangement of outside hung motors. In general features of construction it closely resembles the well-known principles so much used in steam railroad practice for passenger car trucks, with the exception of the omission of the usual equalizing bars. The side frames are of a patent combination, with a center truss rigidly secured to the pedestals and top frames; this combination gives a double factor of safety, and, as designed without equalizing bars, gives the same spring base for the short wheel base truck as can be obtained in a wheel base running from 60 ft. 6 ins. to 70 ft., where the usual steam road type of construction is used. The weight of the car body is carried directly on two double elliptic springs which are seated on the spring plank, consisting of a channel iron and malleable iron seat suspended from swinging links. The swing links are so designed as to provide against racking of the car body on uneven track and when taking curves. The entire weight of both truck frame and car body is received upon the journal boxes by helical springs.

These trucks are provided with an exceptionally strong and desirable brake mechanism. The brake beams are made of angle iron figured at a factor of safety of 6. These brake beams are suspended from the transoms by the special non-chattering type of brake hanger which was invented by R. C. Taylor, mechanical engineer of the Brooklyn Rapid Transit Company. The brake beams are provided with shoe heads into which the beam is keyed, which facilitates the changing or renewing of shoes when same are worn out. The adjustment of brakes may be made either with a turn-buckle or with pins, as in steam railway practice. The truck bolster is provided with wearing pieces which wear against similar pieces on the transom channels, which thus allow for adjustment and insure an even braking at all times.

In designing this form of construction it has been the aim of the Peckham Company to eliminate cast steel or special forged side frames, and in particular to provide a construction with hardly a part to break that cannot be repaired in the ordinary car shop. It is noticeable that very few castings enter into the construction of the truck. This design is known as the short wheel base type No. 25 M. C. B. truck of the Peckham Company. Four hundred of these are now being constructed for the new type of surface cars for the Brooklyn Rapid Transit Company, which will be used in preference to the shorter cars mounted on maximum traction trucks, heretofore used exclusively by this company. This truck is meeting with general popular favor, and in addition to the order received from the Brooklyn Company several other large orders for this type have been entered by the Peckham Company.

LARGE OPEN CARS FOR SAGINAW

The Saginaw Valley Traction Company, of Saginaw, Mich., has received five fifteen-bench open cars from the G. C. Kuhlman Car Company. The company owns and operates all the street railway lines in Saginaw and the interurban railway to Bay City. Riverside Park, a famous amusement resort in the vicinity of Saginaw, is owned by the company. Saginaw and



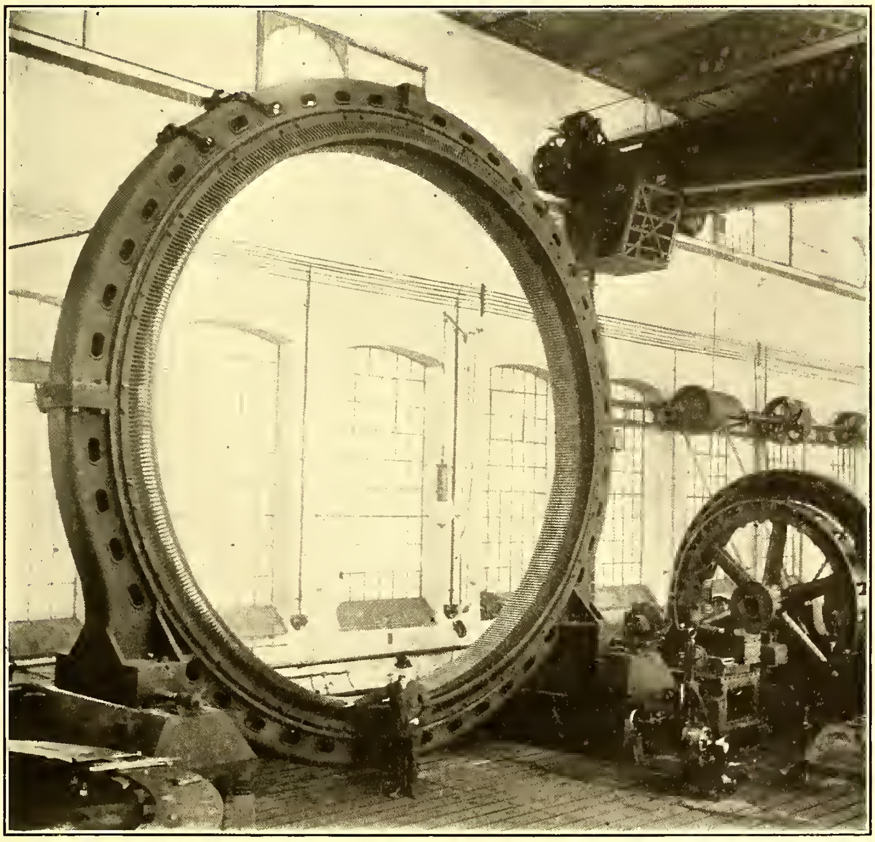
A FIFTEEN-BENCH OPEN CAR FOR PARK SERVICE NEAR SAGINAW, MICH.

Bay City are among the most important cities in the State, the former having a population of about 45,000, and is a prominent railway center, while the latter is one of the six principal lumber centers of the Northwest, with a population of about 30,000.

The car illustrated was photographed on shop trucks, but all the cars were to take trucks of the Brill No. 27-G type. The length over the crown pieces is 28 ft. 8⅜ ins.; width over the sills, 6 ft. 3 ins., and over the posts at the seat ends, 7 ft. ½ in.; sweep of the posts, 5 ins. The side sills are 3¾ ins. x 7 ins., plated by 7-in. x ½-in. steel, and the end sills are 2¾ ins. x 11 ins. The round-corner seat-end panels, angle-iron bumpers, brake handles, platform and signal bells and radial draw-bars are all of Brill manufacture.

ENGLISH ALTERNATORS FOR LONDON COUNTY COUNCIL TRAMWAYS

The extensive plans for additional mileage which the London County Council has under way, and which have been described in these columns, have called for important extensions to its power generating equipment and have led to the placing of large orders for engines and generators. One of the latter has recently been completed at the works of the Electric Construction Company, Ltd., of London and Wolverhampton, and is illustrated in the accompanying engraving. An idea of the size of the machine can be had by comparing the view of the field frame with that of the man standing in the foreground.



FRAME OF ONE OF THE 3200-K. V. A. GENERATORS FOR THE LONDON COUNTY COUNCIL TRAMWAYS

The contract given to this company includes four three-phase 25-cycle generators, each designed to give a continuous output of 3200 K. V. A. at a speed of 94 r. p. m. This output is to be rated with a power factor of 94 per cent. The working pressure is 6600 volts and the current per phase is 280 amps. The machines will be called upon to give an overload of 25 per cent for two hours continuously. The field magnets are placed directly on the rim of the engine fly-wheel, the stored energy of which equals 11,000 ft. tons at normal speed. This company is also constructing the complete fly-wheel.

Arrangements have been made whereby two of the Holland palace cars will be put into service on the Indianapolis & Northwestern, between Indianapolis and Lafayette, on April 1. These cars will be used for limited service only, and will stop only at Zionville, Lebanon, Frankfort, Lafayette and Indianapolis.

THE BOSTON ELEVATED OPERATES FIVE-CAR TRAINS

The Boston Elevated Railway Company began the operation of five-car trains on its elevated division during the rush hours of March 22. The first train left the terminal at Dudley Street at 4 p. m., and the service was continued at regular intervals until 6:30 p. m. It is estimated that the congestion of rush-hour traffic will be relieved at least 25 per cent by this additional service, which will be a feature of daily operation hereafter. To provide for the boarding and leaving of the fifth car all the elevated and subway platforms were lengthened about 45 ft. At Sullivan Square terminal the only change was the removal of a section of each of the two waiting rooms at the Charlestown end of the elevated floor. This alteration enables incoming and outgoing passengers to enter and leave the fifth car more easily, at the same time not interfering greatly with the accommodations of the waiting rooms on either side of the elevated track. At the Dudley Street terminal an extension of about 40 ft. was made on the Dudley Street end of the platform. The iron fences and other fittings have been extended in conformity with the additions. The extension of some of the subway platforms, notably those at Scollay and Adams Squares, presented considerable difficulty in comparison with the elevated stations. In some places the addition to the platforms are narrow at best, on account of the limited available space. The subway changes are not in the nature of permanent improvements, however, for in about three years, when the Washington Street Tunnel is completed, surface cars will be restored to the present subway upon the removal of the elevated trains to the tunnel route.

The use of the new type of elevated cars having pneumatically-operated doors, and no open platforms at the ends, has proved a great success. According to recent tests, about 25 per cent more passengers can be loaded or unloaded in a given time than can be handled on the original elevated cars with open platforms and swinging gates. The reduction in platform labor at stations is also a considerable item. Thus far it has appeared that the pneumatic doors are exceedingly safe for the public. Another improvement in the service has been effected by the installation of additional block signals between some of the subway stations, so that delayed trains can approach more nearly to the platforms, filling up the gaps which otherwise would exist if very long blocks were used.

OFFICE LIGHTING IN SPRINGFIELD

The general offices of the Springfield (Mass.) Street Railway Company are lighted from the car houses adjoining by a motor-generator set of about 15-hp capacity, consisting of a 4-pole, 550-volt motor direct coupled to a 125-volt generator, compound wound and running 1200 r. p. m. The set occupies a floor space of 25 ins. x 74 ins., and requires little attention, generally a casual inspection once every hour or two by the car house employee in charge. It is run all night and stands in a small room at one corner of the car house. The power station is at the foot of Margaret Street, about 1.5 miles away, and as the lamps at times show the effects of the fluctuating trolley voltage, it has been suggested that a more constant brilliancy would be secured by supplying the motor-generator through a special feed-wire connected to the power station bus-bars only.

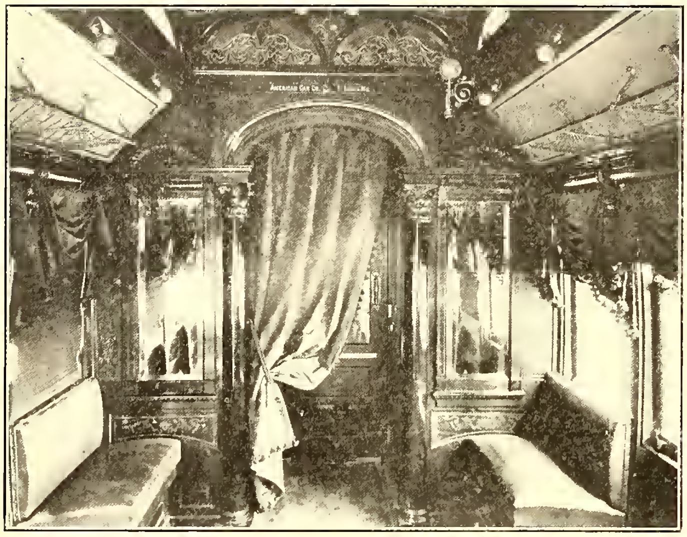
A switch is provided at the car house for throwing the office lights upon the circuits of the United Electric Light Company in case trouble should occur with the motor-generator.

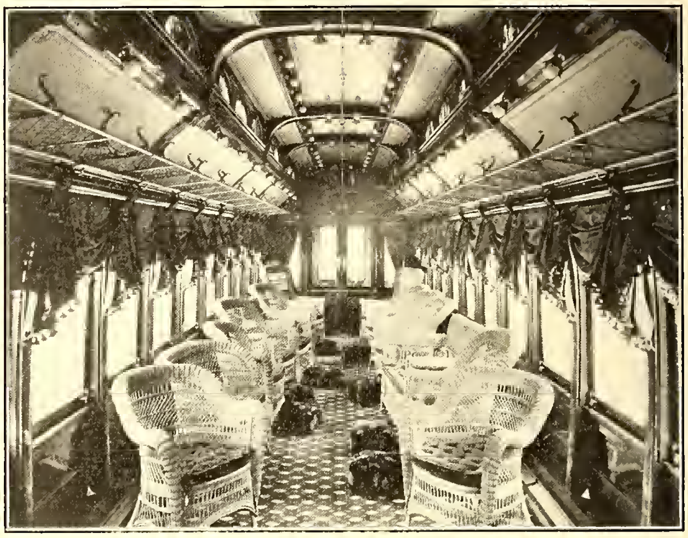
HANDSOME PARLOR CAR FOR THE JOLIET, PLAINFIELD & AURORA RAILROAD

The Joliet, Plainfield & Aurora Railroad, which was fully described in the STREET RAILWAY JOURNAL of Dec. 24, 1904, has recently ordered through the Fisher Construction Company the beautiful parlor car shown in the accompanying illustrations. This car is a product of the American Company, of St. Louis, which also furnished the other rolling stock for this railway, consisting of six 51-ft. combination passenger and baggage cars mounted on Brill 27-E-2 trucks, carrying four GE 67 motors.

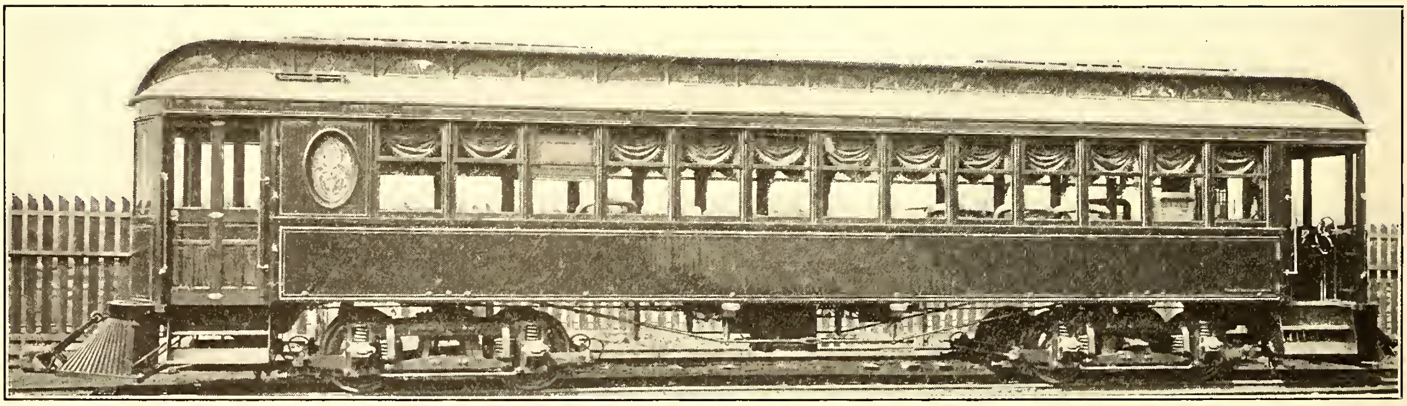
The parlor car is to be used for special trips, and an extra fare will be charged. It also may be chartered by parties for excursion purposes. A large number of passengers are pleasure riders, and the success of the company's amusement resort near Plainfield, known as Electric Park, makes it evident that a car of this type, with its greater attractiveness and comfort, will prove a paying investment. If it seems desirable, at such times when all of the cars are taxed to their utmost capacity, this car will be furnished with smaller chairs than shown in the interior illustration and its seating capacity made practically the same as an ordinary type of interurban car. Should there by a demand for it, the company will also install a buffet for the accommodation of special parties and for regular service.

The car has the Brill semi-convertible window system, which makes it equally suitable for summer and winter service. The window pockets, which are in the side roofs, do not materially alter the appearance of the interior or exterior, as the illustrations show, and one advantage of the arrangement is that passengers may have the windows open as little or as much as they wish, according to the weather and the speed of the car. Curtains are provided for the windows, as well as silk draperies. The draperies, carpet and upholstering are in dark green, the ceilings are tinted light green and the woodwork is of mahogany, finely carved and inlaid, the whole having a very harmonious and rich appearance. A toilet room and heater compartment are at one end of the car, and at the corners of these compartments are carved pillars united by an arch with leaded glass overhead. Mirrors in the sides of the compartments are of heavy beveled plate glass. A recessed dome and semi-empire form of ventilators with opalescent glass make a very effective deck arrangement. The windows and doors are glazed with heavy polished plate, and the windows in the vestibule have pockets in the wainscoting. The arrangement of incandescents may be seen in the interior illustrations, and the continuous parcel racks will also be noted. The interior woodwork of the vestibules and the platform doors are of mahogany. The platforms are 5 ft. from end panels over vestibules. They are dropped and supported by heavy angle-iron center timbers and are reinforced by outside knees. Protection is afforded to them by angle-iron bumpers of Brill manufacture. Other specialties bearing the same name are channel-iron draw-bars, "Dedenda" gongs, "Dumpit" sand boxes, conductors' bells and others. The trucks, which are also of this make, have 6-ft. wheel base and 33-in. wheels.





TWO INTERIOR VIEWS OF THE NEW PARLOR CAR OPERATED BY THE JOLIET, PLAINFIELD & AURORA RAILROAD



THE JOLIET, PLAINFIELD & AURORA RAILROAD COMPANY'S NEW SPECIAL CAR

The general dimensions of the car are as follows: Length over the end panels, 38 ft. 8 ins., and over the crown pieces, 48 ft. 8 ins.; width over the sheathing, 8 ft. 4 ins.; distance from center to center of the posts, 2 ft. 8 ins.; thickness of the corner posts, 3¾ ins., and of the side posts, 3¼ ins.; size of the side sills, 4¾ ins. x 7¾ ins., and of the end sills, 5¼ ins. x 7¾ ins. The sill plates on the inside of the end sills, to which the bases of the posts are secured, are 13 ins. x ⅜ in. The height of the tread of the lower step from the rail head is 16 ins.; from tread to tread of the steps, 11¼ ins.

NEW COUPLER AND DRAFT RIGGING FOR ELECTRIC CARS

A new automatic coupler for interurban, elevated and street cars is being prepared for the market by the Washburn Company, of Minneapolis, a well-known manufacturer of M. C. B. couplers for steam railroads. The Washburn coupler for electric roads is made on the same general lines as the automatic M. C. B. coupler, with the necessary modifications which a swiveling draw-bar makes necessary. It couples and uncouples the same as this company's regular automatic coupler. Fig. 1 shows cross sections through this coupler and with dimensions, while Fig. 2 gives the outlines. For those not familiar with the Washburn coupler used on steam roads, it may be well to explain that on this coupler the pin, or lock as it is frequently called, is arranged so that by raising it half way the knuckle is released for uncoupling. The lock can be left in this position if desired. If the knuckle is closed and it is desired to throw it open to make a coupling, the pin or lock is raised to the full height. By doing this the knuckle is not only unlocked, but is thrown open ready to make a coupling, so that it is unnecessary to throw the knuckle around by hand. Coming now to the essential differences between this coupler and the M. C. B. coupler for steam roads, it should be noted that the steam road coupler is open at top and bottom, but that the electric coupler has a top and bottom wall, and also a bearing face on one side of the coupler, besides a lug on the knuckle, which forms a bearing face on the other side of the coupler. Thus, when the coupling is made, the couplers present to each other faces with considerable bearing surface, and which make the rigid joint that is necessary with swivel draw-bars. As the coupler does not have to follow M. C. B. lines exactly, it has been possible to add considerable strength to the coupler head and knuckle.

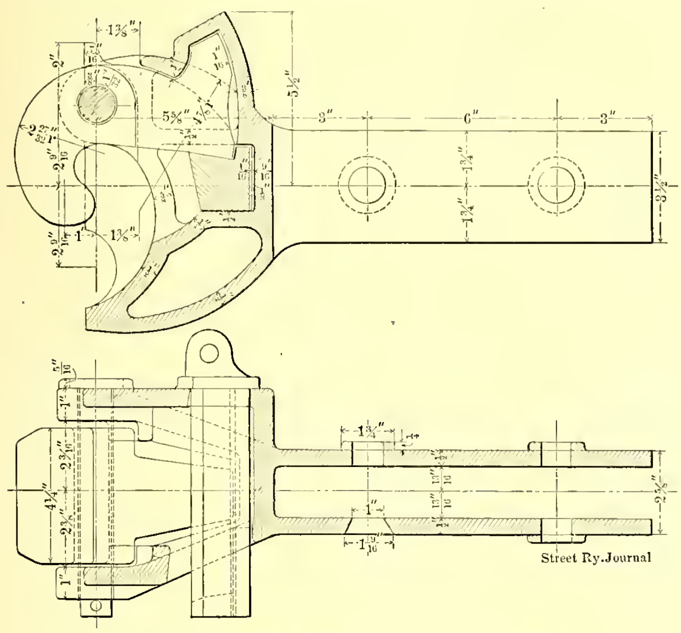


FIG. 1.—CROSS SECTION OF COUPLER

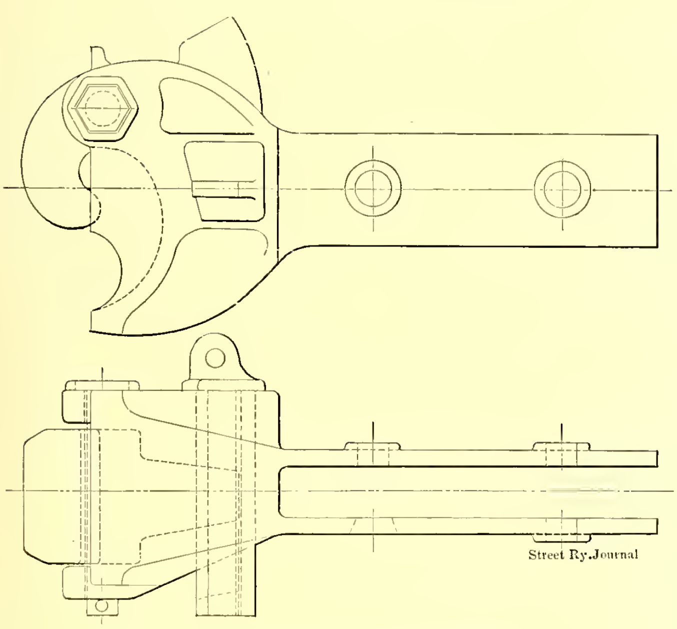


FIG. 2.—OUTLINE OF COUPLER

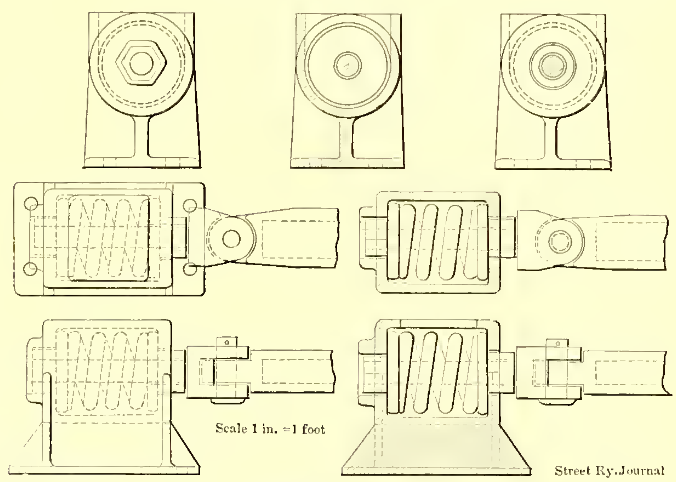


FIG. 3.—DRAFT BOX BOLTED TO CAR

Figs. 3 and 4 show the two forms of draft rigging designed for use with this coupler. In one of these the draft box is bolted directly to the car body, and in the other the swivel is placed behind the draft box, and the draft box turns with the draw-bar. With the latter device the buffing and pulling is straight on the spring, while on the former, when a coupler is at an angle, the thrust does not come directly against the spring. As regards the action in buffing and pulling, both types are the same. One spring serves to cushion both the buffing and the pulling. This spring is enclosed in a circular draft box. The

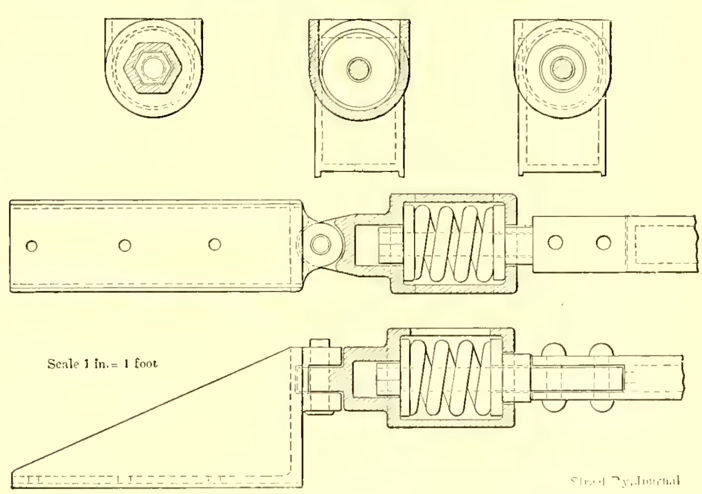
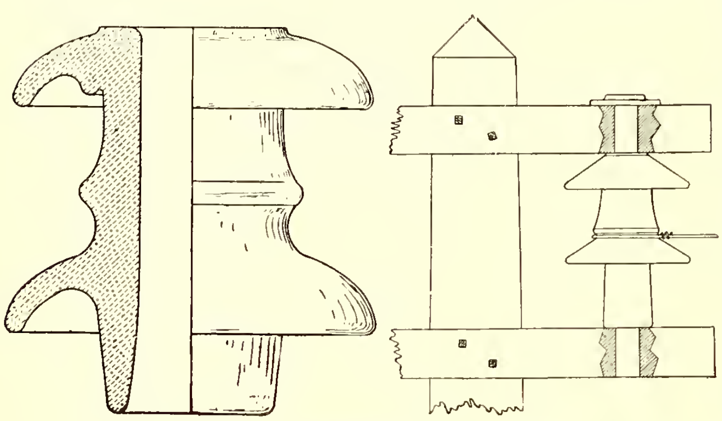


FIG. 4.—SWIVELED DRAFT BOX AND RIGGING

spindle from the draw-bar passes through a follower in the front end of the box and another follower in the rear of the box, and screws into a nut located in a recess in the rear of the box. The spindle is screwed in by turning the spindle, as the nut cannot turn. The nut cannot therefore work loose without turning the coupler head. The device is easily assembled, as the bottom of the draft box is left open. It is assembled by putting in the front follower, then the rear follower, then the spring; after which the spindle is passed through and screwed into the nut. This is, of course, a more compact and simpler arrangement than is sometimes used on street cars with draw-bars having front and rear springs, one for pulling and one for buffing.

HIGH-TENSION STRAIN INSULATORS

The development of high-tension trolley lines has created the need for a type of strain insulator that will satisfactorily meet the new and more difficult requirements. With this demand in mind, the Locke Insulator Manufacturing Company, of Victor, N. Y., has brought out its No. 601 strain insulator, illustrated, which is 6 ins. high and 5¾ ins. in diameter, designed for voltages up to 8000. The company has also developed a smaller design strain insulator for voltages of 5000 and under, and finds that it is very useful in the construction of spans for trolley suspension; in fact, this latter type has proved to be valuable in more places than the manufacturer anticipated.



HIGH-TENSION STRAIN INSULATOR

In this connection it might be of interest to note that the Locke Insulator Manufacturing Company has developed a complete line of strain insulators for tensions up to 35,000 volts, and is developing a new design which will be capable of withstanding voltages of 60,000 or more. The company has experimented considerably with these designs in regard to their mechanical strength, and finds that the larger insulators can be relied upon to stand a break-down test of approximately 12,000 lbs. with the insulator supported by a pin passing through the middle and the strain applied around the middle wire groove. In connection with these insulators, the manufacturer has developed a method of using them whereby almost any strain up to several tons may be applied with entire safety.

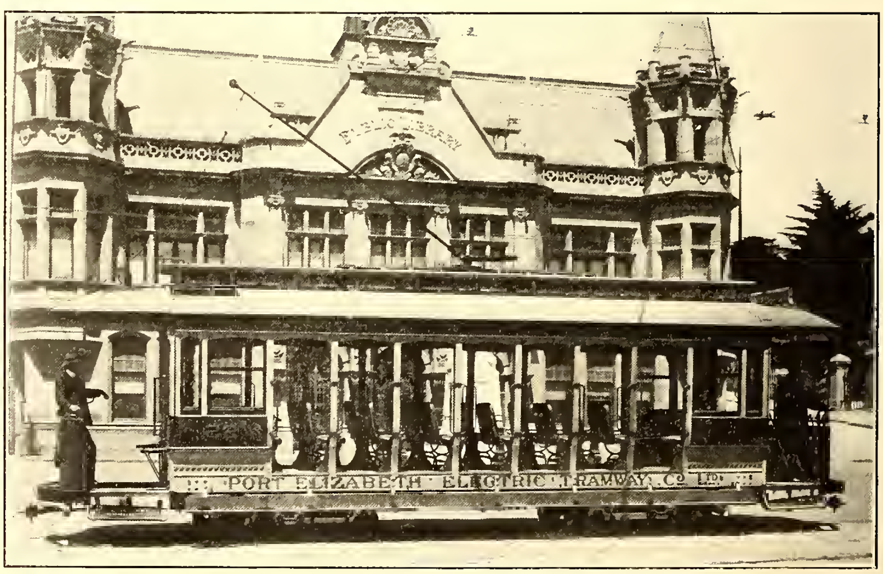
A special despatch from Chicago to hand as the STREET RAILWAY JOURNAL went to press said that the Chicago City Council had granted the Chicago General Railway Company the right to use automobiles in place of street cars.

CONVERTIBLE CARS AT PORT ELIZABETH, SOUTH AFRICA

The interesting views reproduced herewith were taken at Port Elizabeth, South Africa, of cars of the convertible type built by the J. G. Brill Company. One of the cars is shown in front of the handsome Public Library and the other at one of the entrances to the Public Gardens. The city is one of the finest on the South African Coast, and is situated on Algoa Bay, on the southern coast, about 425 miles east of Cape Town. There is a fine harbor with excellent wharfage, and steam lines connect the city with important towns in the interior. The climate is sub-tropical, with a considerable rainfall during the wet season. The main streets of the city parallel with the water front are level, and have many fine business and municipal buildings, while the streets which run at right angles climb a series of grades to the higher levels, where the residential districts are reached. A high mountain range parallels the coast a few miles distant and forms a background to the city, which never fails to excite admiration when first seen from the deck of vessels approaching the harbor.

CLOSED CONVERTIBLE CAR PASSING THE PUBLIC GARDENS

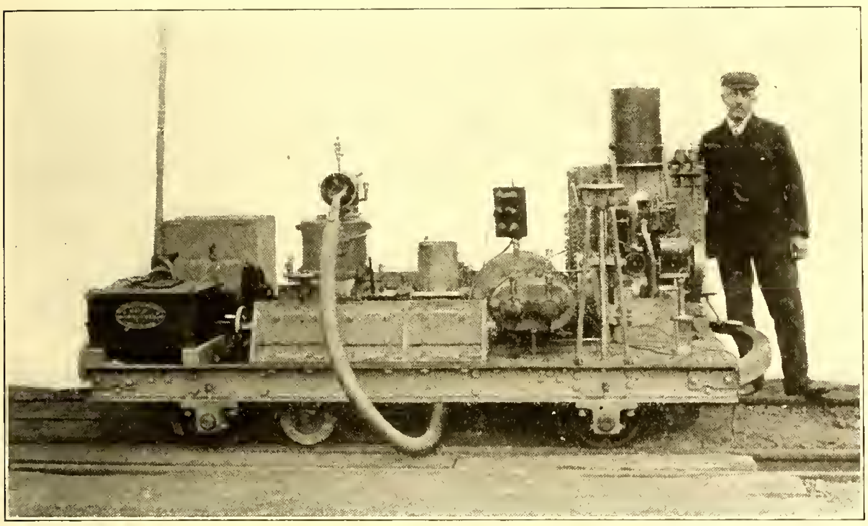
The railway company is controlled by the Cape Town Electric Tramways, Ltd., and the rolling stock consists of cars of the type shown in the pictures. The first lot was supplied by the Brill Company more than a year ago, and the second lot was received recently. It speaks well for the cars that they are unaffected by the alternating heat of the summer and the moisture-laden atmosphere of the rainy season. Two sizes of the cars are used; those on double trucks measure 25 ft. 9 ins. over the bodies, and those on single trucks, 23 ft. 2 ins. The trucks are of the builder's "Eureka" maximum traction and No. 21-E types, and the cars are furnished with seats, gates, sand boxes, bells, draw-irons, buffers and other specialties of the same manufacture. Both sizes of cars are arranged with seats for three passengers each at the corners, thereby giving



OPERATED AS AN OPEN CAR, IN FRONT OF THE PUBLIC LIBRARY ample aisle space near the door to prevent crowding. The seating capacity of the shorter cars is thirty-two, and the longer cars thirty-six. Seats are provided for four additional passengers on the platforms, these seats being arranged to fold against the end panels. The platforms of the shorter cars are 4 ft. long, and the double-truck cars have 4-ft. 3-in. platforms. The interiors are finished in dull cherry, with bird's-eye maple ceilings. The seats are upholstered in spring cane, and have backs of the step-over type so arranged that the operating levers at the aisle end do not come in contact with the bodies of seated passengers.

RAIL-GRINDING, DRILLING AND MILLING MACHINE FOR TRAMWAY SERVICE

The interesting rail-grinding and drilling machine illustrated herewith has been adopted by the London County Council for the track maintenance of the tramways under its control. This device, which is made by the Railway & Engineering Company, of Nottingham, England, is a gasoline-propelled, self-contained machine designed for grinding out the inequalities of tramway rails upon the site. It is also constructed for drilling holes in the rails in any position and for milling out the center slot in a conduit system when the same has become contracted by outside pressure.



TRAMWAY RAIL-GRINDING MACHINE FOR HALIFAX CORPORATION TRAMWAYS

The frame is strongly braced, riveted together and mounted upon two pairs of wheels and mild steel axles secured to the frame by a cast-iron bearing bushed with gun metal. The petrol engine develops 12 hp at a normal speed of 1000 r. p. m., and is fitted with Simms-Bosch magneto electric ignition, a silencer, a circulating water tank with a circulating pump, and a gasoline tank.

The gear casing which contains the gearing and the clutches is connected with the change-speed casing containing the gear to give two speeds of 4 m.p.h. and 6 m.p.h., respectively, in either direction. The change-speed gear and reversing clutches are operated by handles conveniently situated to suit the operator's seat. The seat is arranged so that the driver may face the direction in which he wishes the machine to travel.

The brake gear is arranged so that the cast-iron brake blocks may be held upon each pair of wheels at the same time that the brake is applied. This allows ample provision for control when traveling on severe grades. The grinding wheels are 10 ins. in diameter, made of carborundum or other similar material, and are of three widths, viz.: 2-in. wide for grinding face of rail, 1-in. wide for grinding tip, and ¾-in. or thereabouts to suit the groove of the rail. They are completely covered with a easing to prevent dust and water flying while grinding.

The wheels are mounted upon a spindle, carried by adjustable bearing, and connected by telescopic shafts and universal joints to the gear casing. The telescopic shafts and universal joints allow for the vertical movement of the slide and the transverse movement of the bearing, so as to permit each of the grinding wheels to be accurately adjusted to their work and allowing the operation of grinding to be performed on both rails at the same time.

The longitudinal slide or saddle is arranged for carrying the vertical and transverse slides in a direction parallel with the rail, and which allows the grinding wheels to take a 2-ft. cut at one operation. The saddle is secured to the frame by vees, and is operated from either side of the carriage by hand wheels.

The power for grinding is obtained from the gear in the gear casing, transmitted through the clutch to the shaft, and through gear wheels contained in a second casing to the gear in the bottom casing, and thence to the grinding wheels. The gear in the second casing, which is in the middle of the truck, is provided with a clutch to disconnect the grinding gear when drilling or milling is required to be done.

At the opposite end of the carriage to the gasoline motor is fitted a reducing gear casing containing an arrangement of gearing, and on the top of which is fitted a swivel headstock to enable the flexible shaft to assume the position best suited for it to work with the least resistance when using the same for drilling and milling. The flexible shaft is provided with universal couplings at both ends. The universal coupling on the swivel headstock is protected by a semi-spherical bell of cast iron, and the outside casing of the flexible shaft is protected from mechanical damage by being enclosed in an armored flexible tube.

The automatic track drill is supplied with two twist drills ⅞ in. and 1 in. in diameter. The drill is operated by the flexible shaft through an instantaneous clutch arrangement, which enables the operator to stop the drill without stopping the flexible shaft. The milling cutter for opening out the center slot is mounted upon a compound slide to allow the cutter to be adjusted to its work. The power is applied by the same flexible shaft that is used for drilling.

INCREASED TRAFFIC FROM ELECTRIFICATION OF STEAM ROADS IN GREAT BRITAIN

An extended paper on the status of electric traction for trunk line service in Great Britain, Ireland and Belgium is to be presented at the Washington meeting of the International Railway Association next May, by Ernest Gerard, inspector-general of the department of railways tests and telegraphs of Belgium. The paper contains some interesting statistics as to the increase in traffic on the Liverpool & Southport division of the Lancashire & Yorkshire Railroad. This section, which has 23 miles of double track, was put in operation March 12, 1904, and while no higher speed is made by the express trains with electricity than with steam, the local trains cover the distance in thirty-seven minutes instead of in fifty-four. In addition, there are express trains in each direction every hour instead of four or five a day. There are also electric suburban trains every ten or twenty minutes. The total number of trains has been increased from 74 to 119.

On the Mersey Railway the introduction of electric traction resulted in an increase of passengers from 2,884,770 in the second half of 1902 to 4,153,800 in the corresponding half of 1903.

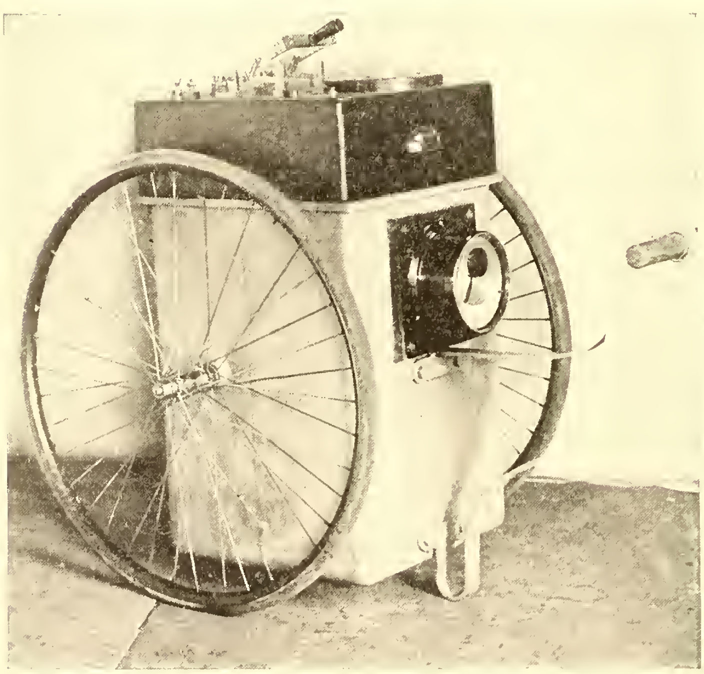
MEMBERSHIP COMMITTEE OF THE AMERICAN STREET RAILWAY ASSOCIATION

It will be remembered that at the St. Louis convention of the American Street Railway Association, the president of the association was empowered to appoint a committee of nine gentlemen to compose a special committee of the association to be known as "The Membership Committee." The number of members in the association at the time of the last convention was only 196, a very small proportion of the total railway companies in the country, and it was believed that if the advantages of belonging to the association could be pointed out to those companies who are not now members of it, a considerable increase could be secured. Mr. Ely has now announced the membership committee, which is as follows: H. H. Vreeland, president, New York City Railway Company; C. S. Sergeant, vice-president, Boston Elevated Railway Company; James F. Shaw, president, Boston & Worcester Electric Railway Company; William A. House, general manager, United Railways & Electric Company, of Baltimore, Md.; H. J. McGowan, president, Indianapolis Traction & Terminal Company; W. Caryl Ely, president of the American Street Railway Association; James H. McGraw, STREET RAILWAY JOURNAL, New York; Daniel Royse, "Street Railway Review," Chicago; John J. Lane, secretary, New England Street Railway Club, Boston.

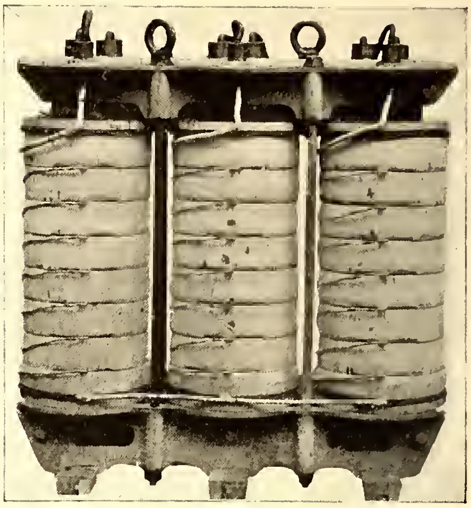
CORE-TYPE TRANSFORMER

As a result of its long experience in designing and constructing single-phase and polyphase transformers, the Brush Electrical Engineering Company, of London, has incorporated in them a number of charactertistic features, among which are the methods of interspacing and insulating the coils, and the means for the prompt replacement of injured coils.

The primary and secondary coils are each wound independently on formers. The secondary winding is placed next to the core and the primary on the outside of the secondary. The insulation between secondary and iron, and between primary and secondary, consists of special tubes. The primary winding is divided into several coils, each of which is separately taped with oiled linen. The insulation between layers consists of the finest paper, which projects beyond the end of each layer, thus insuring immunity from break-down through short-circuit between layers. Over the iron core is slipped a tube of insulation on which the secondary coil is directly wound. Over the secondary coil is then slipped another tube of insulation, and over this are slipped the primary coils, which are then connected up as desired. If spare coils and insulation tubes are kept in stock, a transformer can readily be repaired in an hour or two, and immediately placed in service. The cost of repairing the transformer is a very small item, only that part of the winding that is actually injured being replaced, whereas when transformers of numerous other designs are injured they must be returned to the factory and be completely rewound. The transformers are provided with a cast-iron case having radiating flanges for assisting in keeping the oil cool. The case is perfectly oil-tight, and is provided with a screw plug for emptying the oil when required. The core is built up of iron stampings .014 in. thick, carefully varnished to insure individual insulation, and thereby to reduce eddy currents. The iron is selected with especial reference to its low hysteretic constant and non-ageing quality. The end supports of the core serve both for holding the laminations in place and for protecting the coils.



PORTABLE TRANSFORMER OUTFIT, WITH VOLTMETER, SAFETY SWITCH, FUSES AND RED INDICATING LAMP FOR TESTING TO 10,000 VOLTS



THREE-PHASE STAR CONNECTED TRANSFORMER WITHOUT CASE

A NOVEL TRACTION SERVICE

The Dayton & Troy Electric Railway Company recently mailed a letter to each of its farmer patrons along the line between Dayton and Tippecanoe City asking his opinion of a special market service which the company proposes to install. Hundreds of farmers in the district drive into the city on market days. The company proposes to run a special train on these days to be known as the "Marketmen's Special." It is planned to have the train arrive in Dayton before the opening of market and return after market closes. The company offers low rates for hauling market produce, and free storage room will be furnished at the company's freight station for market stands when not in use. Large hampers with lids and locks will be furnished for use in bringing stock to market. These will be transported free when accompanied by a passenger holding the marketmen's ticket. In winter, danger of freezing will be eliminated by heating the car. Whether or not this service will be installed depends upon the attitude of the patrons whom it is intended to serve. Meetings will be held at two or three points along the line when the proposition will be formally put to them.

On April 1 the Syracuse Rapid Transit Railway Company will inaugurate an express and parcel delivery service between Syracuse and the villages of East Syracuse, Liverpool, Onondaga Valley and Solvay. Express cars for the service have been built in the company's own shops. Edward F. DeGraw, formerly with the American Express Company, has been made traffic manager for the freight department of the system.

LEGAL DEPARTMENT*

LIABILITY TO PERSONS INTENDING TO BECOME PASSENGERS

In the Dec. 5, 1903, issue of this paper the writer discussed the question of the liability for injuries sustained in boarding moving cars. A somewhat related question is that of the liability of a street car company for injuries to persons in the street who intend to become passengers, but have not actually attempted to enter the car. A recent decision by the Supreme Judicial Court of Massachusetts (Duchemin vs. Boston Elevated Ry. Co., 71 N. E., 780) treats with great ability the question, Who are passengers? It is held, very soundly we think, that the technical relation of carrier and passenger does not commence until a person has touched the step, or the hand rail, or some other part of the car, with the purpose of boarding it. The Massachusetts court shows that the relation of passenger cannot exist piecemeal. The railway company is not bound to protect a departed or intending passenger from assaults of passersby in streets. There must be some time fixed for the inception of the relation in all its aspects and with all its consequences, and the moment when the intending passenger first takes hold of the car would seem to be the proper point at which to draw the line.

Nevertheless, the abstract distinction between a passenger and a non-passenger may not be as practically important as at first blush it would appear. In the Massachusetts case the declaration alleged that as the car approached plaintiff he went toward it for the purpose of entering it, having given the motorman notice of his purpose so to become a passenger, and that as he was about to get on the car the trolley pole fell, striking a sign upon the car, and the pole and sign struck the plaintiff, he being in the exercise of due care and the defendant negligent. The trial court had instructed the jury that the plaintiff was entitled to rely upon the technical status of a passenger and therefore the company owed him the obligation of extraordinary care of a common carrier. Conceding that this instruction was erroneous, and that a reversal of the judgment in favor of plaintiff was therefore correct on this ground, the fact still remains that a street railway company owes reasonable care to any pedestrian in the street, and, further, that the practical situation of the plaintiff was necessarily different from that of an ordinary pedestrian. Although he was not technically a passenger, he unquestionably had the right, as an intending passenger, to approach so near the car that he was liable to be injured by the falling trolley pole. This consideration would bear very cogently, perhaps conclusively, upon the issue of his freedom from contributory negligence. The fall of a sign and trolley pole upon a person rightfully standing within their reach might result from neglect of reasonable and ordinary care, and be actionable, even at the suit of one who was not a passenger.

Nor would any distinction exist between a passenger and a non-passenger on the score of burden of proof. On Dec. 13, 1902, the doctrine *res ipsa loquitur* was discussed in this place. That rule, as will be remembered, is that, under certain circumstances, the mere happening of an event itself raises the presumption of negligence, so that the burden is not on the plaintiff to prove, but on the defendant to disprove, negligence. This doctrine has been quite extensively administered in cases of accidents on steam and street railways, where the casualty occurred through derailment, or defects of machinery, as the facts are difficult of ascertainment by the plaintiff, but are, or should be, within the special knowledge of the defendant. It is probably that in many jurisdictions it would be held that where a person intending to become a passenger is injured by such a casualty as the fall of a trolley pole, a presumptive case of lack of ordinary care is made out, and the burden is cast upon the defendant of affirmatively proving due care. A recent well considered decision in the Supreme Court of Nebraska (Lincoln Traction Co. vs. Webb, 102 N. W., 258) tends strongly in favor of such view. It holds, as do all well considered authorities, that the rule *res ipsa loquitur* may not be resorted to in cases of accident, when the condition of the machinery remains normal, and there is merely a dispute of fact whether the plaintiff fell from the car at a standstill or the car was negligently started before he had fair opportunity to alight. The Nebraska decision does, however, in harmony with the Federal courts and many State courts, squarely hold that the presumption of negligence, if it is to be indulged so as to shift the burden of proof from the plaintiff to the defendant, must originate "from the nature of the act, not from the nature of the relation between the parties." In such view the technical question whether the plaintiff was or was not a passenger would be immaterial. In Griffin vs. Manice (166 N. Y., 188) it was held by the New York Court of Appeals, in a case of injury to a person through the fall of a passenger elevator in an office building, that the doctrine of *res ipsa loquitur* would apply, although the court expressly refused to class the proprietor of the elevator as a common carrier, and as such, responsible for extraordinary care.

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LIABILITY FOR NEGLIGENCE.

ALABAMA.—Street Railways — Carriers — Passengers—Creation of Relation—Riding on Platform—Contributory Negligence—Admissibility of Evidence—Comparative Negligence.

1. In an action against a street railway company for injuries sustained by a passenger owing to cars becoming uncoupled because of defective couplings, it appearing that the couplings used were the same as those used at a time when a witness was employed by defendant, it was proper to permit him to be asked how often in his experience couplings had become uncoupled or broken loose.

2. Where a train of street railway cars was so crowded inside the cars as not to admit of others entering, but it continued to stop at each stopping place, and others were allowed to get on, a person who got on the car and stood outside the vestibule was a passenger, though he had not been seen by the conductor, and though his fare had not been collected.

3. The fact that a passenger on a street car assumes a dangerous position does not alter his character as a passenger, or alter the degree of care that the carrier owes to him.

4. Where a passenger on a street car, which was so crowded that he could not enter the car proper, stood on a projection outside of the vestibule, and was injured owing to a car in the rear of that on which he was being carried riding up onto the rear of such car owing to the breaking of a defective coupling, the question whether plaintiff was guilty of contributory negligence which proximately contributed to his injury was one for the jury.

5. The question of the carrier's negligence in failing to provide a safer coupling was one for the jury.

6. The doctrine of comparative negligence does not obtain in Alabama.

7. In an action for injuries, any want of care, however slight, on the part of the injured person, contributing proximately to cause of injury, defeats his recovery.—(Birmingham Ry., Light & Power Co. vs. Bynum, 36 S. Rep., 736.)

ARKANSAS.—Street Railroads—Collision with Team—Negligence—Reciprocal Duties—Presumption—Imputed Negligence—Burden of Proof—Res Gestæ—Instructions.

1. Instructions leaving it to jury to determine the facts, and declaring that certain facts, if found, constitute actionable negligence, are proper, such facts being such that in reason and fairness there can be no difference of opinion as to the conclusion to be drawn from them.

2. The duty of using ordinary care to prevent the collision in a street of a team and street car is reciprocal.

3. In case of collision between a team and street car, the test of negligence in the rate of speed, sounding of gong or bell, lookout to be kept, etc., in the absence of statutory regulations, is whether that was done which a reasonably prudent man should do under the circumstances.

4. It is not negligence per se to drive a team along a street railway track; but the person so doing should keep a lookout, though not required, as matter of law, to keep a constant lookout to the rear.

5. In case of collision between a street car and team there is no presumption as to whether it was caused by the negligence of the driver of the one or the other.

6. Failure to sound the gong or bell of a street car is not negligence as to one struck thereby, who had actual knowledge of the car's approach.

7. The contributory negligence of the driver of a private team struck by a street car is not attributable to one riding as his guest or companion, he having no authority or control over the person with whom he is riding.

8. The burden as to proof of contributory negligence is on defendant, unless it is shown by plaintiff's evidence.

9. In an action for collision between a team and street car, there being a question of fact whether the motorman knew, or by the exercise of ordinary care might have known, that the wagon was in a dangerous position, instructions as to the duty of the motorman in stopping, or checking the speed of the car, and ringing the gong, are erroneous in making the fact of the proximity of the wagon to the railroad track, and not the knowledge of the fact by the motorman, the criterion of his negligence.

10. Statements of a witness made several minutes after a street car collision, and after the car had left, are not admissible as part of the res gestæ, but merely to contradict the witness.

11. There is no negligence on the part of the motorman of a street car, where, while the wagon with which the car collides occupies a position enabling the car to pass it, the motorman on the car approaching from the rear rings the gong, and those on the wagon can hear the warning by the exercise of ordinary care and attention, and after this the wagon is driven suddenly in front of the car, and so close to it to make it impossible to stop the car by the exercise of ordinary care and reasonable effort.

12. Each party is entitled to an instruction announcing the law applicable to the evidence as introduced in his behalf.—(Hot Springs St. Ry. Co. vs. Hildredth; 82 S. W. Rep., 245.)

CONNECTICUT.—Carriers—Injuries to Passengers—Alighting from Car—Negligence—Contributory Negligence—Practice—Default—Burden of Proof.

1. In an action for personal injuries, the admissions by defendant of the averments of the complaint, by suffering a default, imposes upon defendant the burden of either disproving its alleged negligence, or of proving contributory negligence on the part of plaintiff.

2. One who alighted from an electric car, after the announcement of the conductor that the terminus of the road had been reached under the belief that the car had stopped, and while its motion was practically imperceptible, was not guilty of contributory negligence, in fact or in law.

3. It is the duty of a company operating an electric railroad to afford passengers a reasonably safe opportunity to alight from the cars.

4. Whether the acts and conduct of the conductor of an electric car in calling out the name of the station, and leaving the platform and putting up the fender, amounted to an invitation to a passenger to leave the car, was a question of fact.

5. In an action against an electric railroad for injuries to an alighting passenger, evidence held sufficient to support a finding of negligence of the conductor, in calling the name of the station, and otherwise indicating that it was time for passengers to alight, and that plaintiff was justified in believing that it was intended that she should alight.—(Elwood vs. Connecticut Ry. & Lighting Company, 58 Atlantic Rep., 751.)

CONNECTICUT.—Street Railroads—Injury to Child on Track—Contributory Negligence—Degree of Care Toward Infants—Findings—Review.

1. A child about eight years of age may be guilty of contributory negligence precluding a recovery for injuries received.

2. Where, in an action against a street railway company for running over a child about eight years old, defendant proved that the child was guilty of contributory negligence in running in front of an approaching car, plaintiff, in the absence of proof that the injury was wantonly inflicted, could not recover substantial damages.

3. The defense of contributory negligence on the part of a child about eight years of age is not established by proof that the child failed to act with the prudence required of an adult under the circumstances, but it must be shown that he failed to exercise the care reasonably to be expected of children of similar age and experience under the circumstances.

4. Findings on questions of fact are not reviewable on appeal.

5. The same degree of care is required toward infants as toward adults, but the conduct which comes up to that degree of care when exercised toward adults may fall short of it when exercised toward infants under the same circumstances.—(Rohloff vs. Fair Haven & W. R. Company, 58 Atlantic Rep., 5.)

DELAWARE.—Street Railways—Collision with Team—Duty in Approaching Crossing.

The motorman of a street car, and likewise the driver of a team, in approaching a crossing, must, where the line of vision is obstructed, use increased care and caution in proportion to such conditions.—(Dungan vs. Wilmington City Ry. Company, 58 Atlantic Rep., 868.)

GEORGIA.—Non-Suit—Street Railroads—New Trial—Instructions—Injury to Traveler—Presumptions.

1. While the allegations of the petition as to negligence were somewhat vague and indefinite, the defendant did not demur, and the evidence for the plaintiff made out her case as laid sufficiently to withstand a motion for a non-suit.

2. Grounds of a motion for a new trial complaining of the refusal of the court to charge stated contentions of the complaining party, but which do not show that any written requests to charge were submitted to the trial judge, will not work the grant of a new trial unless the instructions referred to were demanded.

3. The charge of the court, instructing the jury to determine whether the motorman of the defendant's car saw the frightened condition of the horse which was alleged to have run into the plaintiff's buggy, and failed to stop or check the car, while not aptly worded, is not of itself ground for a new trial.

4. There is no merit in a ground of a motion for a new trial complaining that the court, in giving a legal and pertinent charge, failed to charge in connection therewith a contention of the complaining party which was also applicable to the case on trial.

5. The plaintiff's buggy was run into by a frightened horse drawing another buggy, and she was injured. A car of the defendant was passing at the time. She did not allege in her petition that the fright of the horse was originally caused by any act of the defendant, or that the car was running too fast or with any unusual or unlawful noise, but merely that, after seeing the frightened condition of the horse, the motorman failed to stop his car, thereby aggravating the fright of the horse and causing him to run away. Held, no presumption of negligence arose against the defendant upon proof of the injury, but it was incumbent upon the plaintiff to prove negligence as alleged. It was therefore error to give in charge to the jury the provisions of Civ. Code 1895, Sec. 2321.—(Atlanta Ry. & Power Co. vs. Johnson, 48 S. E. Rep., 389.)

GEORGIA.—Street Railroads—Injury to Passengers—Evidence.

1. The estimates of the witnesses as to the rate of speed varied. Some placed it at 6 miles an hour, which was lawful; others, at more than 15 miles an hour, which was in excess of that alleged to be allowed by ordinance. There was no contradiction of the testimony that the plaintiff and two other passengers were jerked and hurled from their seats while the car was rounding a sharp curve. The physical facts were of more evidentiary value than the opinions of non-experts. Under the circumstances, estimates that the speed was not improper were insufficient to overcome the presumption arising from the fact of the injury, and the verdict for the defendant was contrary to law.—(McEwen vs. Atlantic Ry. & Power Company, 48 S. E. Rep., 391.)

GEORGIA.—Comparative Negligence—Pleadings as Evidence—Non-Suit.

1. Under the evidence the jury might fairly infer that the defendant was negligent in running its cars. If the plaintiff and the defendant were both negligent, the former can recover, unless his negligence was equal to or greater than the negligence of the defendant, or unless he could, by the exercise of ordinary care, have avoided the consequences of the defendant's negligence. The latter question is, under the plaintiff's evidence, unexplained, a close one, and should have been submitted to the jury.

2. Where the plaintiff introduces in evidence a paragraph of the defendant's answer, part of which is in his favor and part against him, the plaintiff is not estopped to rebut the parts which are against him, nor is the jury bound to take them as true. In such case the jury may, for sufficient reasons, believe a part of the admissions and disbelieve the other part; this being a question purely for the jury.

3. It was error to grant a non-suit.—(Christian vs. Macon Ry. & Light Company, 47 S. E. Rep., 924.)

ILLINOIS.—Street Railways—Crossing Accident—Negligence—Contributory Negligence—Question for Jury—Instructions—Excessive Damages—Remittitur.

1. In an action against a street railway company for injuries sustained by plaintiff because of a collision between a car and the wagon which he was driving, the question of defendant's negligence held one for the jury.

2. In an action against a street railway company for injuries sustained by plaintiff owing to a collision between a wagon which he was driving and a car, the question of plaintiff's contributory negligence held one for the jury.

3. The determination of the Appellate Court on questions of fact is conclusive on the Supreme Court.

4. In an action against a street railway company for injuries sustained by plaintiff owing to a collision between a wagon which he was driving and a car, the court instructed that in determining the amount of plaintiff's damages the jury had the right to take into consideration "all the facts and circumstances in evidence," the nature and extent of his injuries, etc. Held, that the instruc-

tion was not erroneous, because it told the jury that they might take into consideration all the facts and circumstances.

5. An appellant cannot complain of conduct of counsel in making remarks to the jury, where the attention of the trial court was not called to the remarks by a specific objection, and an exception preserved.

6. Remittiturs are allowable in actions ex delicto in the trial court to such sum as would seem not excessive damages.

7. Remittiturs are allowable in actions ex delicto in the Appellate Courts to such sum as would seem not excessive damages.—(Chicago City Ry. Company vs. Gemmill, 71 N. E. Rep., 43.)

ILLINOIS.—Carriers—Street Railroads—Injuries to Passengers—Time to Alight—Actions—Evidence—Non-Experts—Speed—Bodily Condition—Hypothetical Questions—Statements to Physicians—Rebuttal—Offers of Compromise—Instructions—Requests—Intermediate Appeal—Questions of Fact—Review by Supreme Court.

1. A judgment for plaintiff, affirmed by the Appellate Court, cannot be reversed on a further appeal to the Supreme Court as against the weight of the evidence, there being some competent evidence in the record fairly tending to prove plaintiff's case.

2. Where, in an action for injuries to a passenger on a street car, defendant introduced evidence that on an occasion after the accident, in the presence of plaintiff and two other women, plaintiff's husband stated that the accident was due to plaintiff's fault, to which plaintiff did not reply, and plaintiff in rebuttal was asked whether she ever had such a conversation in the presence of such women, and answered, "No, sir; I remember two women," and on being asked what took place stated that such women told her they came to settle with her for $200, and that she could get more than that amount, but it would take four or five years before her case came up, plaintiff's testimony was not objectionable as referring to a different conversation from that testified to by defendant's witness.

3. Evidence of such conversation having been first offered by defendant, plaintiff was entitled to prove the balance, though it tended to show an offer of compromise.

4. Where a question asked of a witness was not answered, and no objection was interposed to the asking of the question, and no exception was noted to any ruling thereon, the asking of such question and the remarks of the court with reference thereto were not reviewable on appeal.

5. In an action for injuries to a passenger of a street car while she was attempting to alight, evidence that she asked the conductor to let her off at the place where she started to alight, and that he promised to do so, was admissible.

6. In an action for injuries to a passenger a non-expert witness may testify as to the speed with which the car was started.

7. Non-expert witnesses cannot testify that plaintiff, after the injury complained of, was in a nervous physical condition.

8. In an action for injuries to a passenger, statement made by her to physicians during actual treatment and in immediate connection therewith, though made after the commencement of suit to recover for such injuries, are admissible.

9. In asking hypothetical questions of a medical expert counsel may assume, within the limits of the testimony, any state of facts claimed to be justified by the evidence, and have the opinion of the expert on the facts so assumed, and, if all the relevant facts are not included, questions including them may be propounded on cross-examination.

10. In an action for injuries to a passenger while attempting to alight from a street car, admission of evidence of plaintiff's husband that plaintiff made complaint after walking a considerable distance, without stating what the complaint was, or being allowed to give his opinion as to the nature thereof, was not reversible error.

11. In an action for injuries to a passenger, an instruction as to the degree of care required of a carrier of passengers was not error for failure to state the care required of the passenger, which was sufficiently set forth in other instructions.

12. An instruction that the preponderance of the evidence "is not alone to be determined by the number of witnesses" testifying to a particular state of facts, and naming several of the elements which the jury should consider in determining where the preponderance lay, was not objectionable on the ground that it omitted the element of the number of witnesses testifying to any particular fact or state of facts.

13. In an action for injuries an instruction that while, as a matter of law, the burden of proof is on the plaintiff to prove her case by a preponderance of the evidence, yet if the jury find that the evidence preponderates in her favor, though but slightly, it will be sufficient for them to find the issues in her favor, was proper.

14. An instruction defining reasonable care to be such care as persons of ordinary prudence and intelligence would ordinarily exercise for their own safety was not prejudicial to defendant in including the element of "intelligence" as well as "prudence."

15. An instruction that if the jury believe from the evidence that any witness had willfully sworn falsely to any material element of the case, or had knowingly exaggerated any fact or circumstances material to the issues for the purpose of deceiving, misleading, or imposing on the jury, "either as to the origin of plaintiff's alleged ailments, so far as, from all the evidence, you believe they existed, or as to the nature and extent of the alleged injury, or as to the manner of the alleged accident in question," the jury may reject the entire testimony of such witness, except so far as he is corroborated by other evidence, etc., was properly modified by striking out the part quoted.

16. Requested instructions, not based on any evidence in the record, are properly refused.

17. It is not error to refuse requested instructions substantially covered by other instructions given.—(Chicago City Ry. Company vs. Bundy, 71 N. E. Rep., 28.)

INDIANA.—Street Railways—Injuries to Pedestrian—Minors—Contributory Negligence—Trial—Instructions—Weight of Evidence—Assumption of Facts—Cars—Equipment—Brakes—Modern Pattern.

1. An instruction that the preponderance of evidence is not necessarily on the side of a fact on which the greater number of witnesses have testified, or on which the greater amount of evidence is produced, but is with that evidence which convinces the jury most strongly of its truthfulness; that "preponderance of evidence" means the weight of evidence; that the evidence given on any fact which convinces most strongly of its truthfulness is of the greater weight, irrespective of the number of witnesses or the amount of evidence on the other side—was not objectionable as invading the province of the jury.

2. In an action for personal injuries to an infant, an instruction that it was the duty of a street railway company to run its cars with due regard to the rights of infirm, aged persons, and children of tender years; that these persons have the right to use the streets, and the company is liable if it does not use ordinary care, in proportion to the danger, to prevent injury to the various classes—was correct.

3. In an action for personal injuries to an infant, an instruction that a child under three years of age could not be guilty of contributory negligence, and that it was the duty of all persons, in the operation of machinery, etc., to take this rule of law into consideration, and that defendant, in the operation of its street cars, could not avoid its liability by showing that the action of the child contributed to the injury, if he was under three years of age, was not erroneous because not containing any supposed state of facts establishing liability.

4. The instruction correctly stated the law.

5. An instruction that the jury must decide the case on the evidence and in accordance with its preponderance, while objectionable for the use of "its," could not be presumed to mislead the jury or harm the appellant.

6. An instruction complained of stated that it might be presumed that a person on the street railway track on which a car was approaching would leave the track before the car reached him, and that one approaching a track will not attempt to cross it unless he has sufficient time, but that such presumption did not apply to a child not three years old, and, as to such child, the person controlling the car must make sure that the child will be free of the track before the car reaches him. The next instruction stated that, where persons were using or crossing the street railway tracks, the motorman must keep his car so under control that he might stop it quickly in case of sudden danger, and that this was particularly true as to children of tender years. Held, that the instruction complained of did not make the street car company liable in case of unavoidable accident.

7. An instruction that a street car company should not use obsolete cars, that are difficult to control, or without good equipment to stop, and if by such use an injury is inflicted, when a more modern or complete car, such as is generally used, would not have caused the injury, the company is guilty of neglect, but that this rule does not require the company to use the most recent pattern or kind of car and brake manufactured, but to use such a pattern or kind as is in general use in cities or towns of the size where it is used, was correct.

8. In an action for injuries to a child, an instruction that the fact that the wife of the plaintiff may have been guilty of negligence, in not preventing the child from going on or into the street, would not prevent the plaintiff recovering, if the motorman, "after he became aware of the danger of the child," could have avoided injuring him by the use of such care as the dangerous position of the child and its age required him, under the circumstances, to exercise, was not objectionable as discrediting the defendant's

theory that the child was on the track, immediately in front of the car.

9. There was no such assumption of any fact in the instruction as would mislead the jury.

10. There was no error in refusing an instruction completely covered by an instruction given.—(Indianapolis St. Ry. Company vs. Schomberg. (No. 4895.) 71 N. E. Rep., 238.)

INDIANA.—Carriers—Injury to Passenger—Complaint—Sufficiency—Proximate Cause—Servants—Scope of Employment—Instructions—Burden of Proof—Preponderance of the Evidence—Res Ipsa Loquitur.

1. In an action against a street railway company for injuries to a passenger, the complaint alleged that defendant negligently ran its car at a dangerously high rate of speed into a switch, off the track, and against a pole, throwing plaintiff to the floor and against a stove, injuring him. Held to sufficiently allege that defendant's negligence was the proximate cause of the injury.

2. An averment, in a complaint against a street railway company for injuries to a passenger, that the defendant, through and by its servants in charge of the car, negligently ran the car, etc., sufficiently alleged that the servant in charge of the car was acting in the scope of his employment.

3. In an action for personal injuries, a statement in an instruction that the rule that plaintiff could not recover for any aggravation of his injuries caused by his own neglect did not depend in any way on plaintiff's financial condition, or his desire to earn money, was improper, even though plaintiff had testified that he "was not a millionaire."

4. A street railway company is not free from liability for an accident to a car, caused by a stone on the track, unless it exercised the requisite care in running its car and avoiding the danger caused by the presence of the stone.

5. A presumption of negligence on the part of the carrier arises from an injury to a passenger.

6. If the evidence on any question is evenly balanced, the decision of the jury on that question must be against the party having the burden of proof.

7. An instruction that, if all other things were exactly equal in all respects, the witnesses of equal intelligence and credibility, having equal opportunities of knowledge, testifying with equal candor, intelligence, and fairness, the weight of the evidence would be considered to be on the side having the greatest number of witnesses, even if erroneous, was harmless, where no such situation existed in the case.

8. In an action against a street railroad company for injuries to a passenger alleged to have resulted from excessive speed of the car, and in which there was testimony as to its speed, refusal to strike from plaintiff's testimony the expression, "They were going so fast," was harmless.

9. In an action for personal injuries, testimony that the injury would be aggravated by riding on a locomotive, did not harm defendant.

10. In an action for personal injuries it was competent to prove expressions of pain and suffering or indication of such condition by groans or cries, and that plaintiff after the injury "complained of his side."

11. Admission of such evidence, even if erroneous, would not justify a reversal.—(Indianapolis St. Ry. Company vs. Schmidt. (No. 20,324.) 71 N. W. Rep., 201.)

KENTUCKY.—Street Railroads—Bicycles—Contributory Negligence—Instructions.

Plaintiff, who was riding a bicycle alongside defendant's street car track, was injured by falling against the side of a passing car, which approached him from the rear. Plaintiff was not on the track at any time, and as the car approached was not in danger, so long as he continued his course; and the motorman testified that as he approached he sounded the gong, and that plaintiff appeared to draw further away from the side of the track, and that the front end of the car passed him in safety. Held, that plaintiff's danger was not an obvious one, and hence an instruction that, if the motorman saw plaintiff's peril in time to have avoided injuring him, but failed to do so, defendant was liable, not withstanding plaintiff's contributory negligence, was properly refused.—(Shaw vs. Louisville Ry. Company, 81 S. W. Rep., 268.)

KENTUCKY.—Carriers—Street Railway—Injury to Passenger—Starting Car—Passenger Alighting—Instructions—Evidence—Sufficiency.

1. In an action against a street railway company for injuries to a passenger, evidence held sufficient to show that plaintiff was in the act of alighting from the car when it started.

2. Where a passenger on a street car was injured by the sudden starting of the car while she was alighting therefrom, defendant was liable for the injuries, though the car had not stopped for the purpose of discharging passengers, if the employees in charge of the car started it when they knew, or by the exercise of proper care could have known, that a passenger was attempting to alight.

3. In an action against a street railway company for injuries to a passenger, it was error to refuse instructions defining the kind of care which defendant owed to plaintiff, and the kind of care which she should exercise for her own safety.—(Houghton vs. Louisville Ry. Co., 81 S. E. Rep., 695.)

KENTUCKY.—Street Railways—Trespassers on Cars—Children—Duty to Discover—Evidence.

1. A child, though non sui juris, riding on the step of the rear platform of a street car, on the side which is not in use, and across which is a closed gate, is a trespasser, to whom the street railroad and those in charge of the car owe no duty of discovering his peril.

2. In an action to recover for injury to a child trespassing on the rear step of a street railway car, testimony that the point where plaintiff got on the car was in a thickly settled portion of the city, and that many children congregated thereabouts, and had often trespassed on defendant's cars theretofore with the knowledge of the employees, was properly excluded.—Monehan vs. South Covington & C. St. Ry. Company, 78 S. W. Rep., 1106.)

MAINE.—Street Railways—Country Crossings—Contributory Negligence—Traveler.

1. The conditions of a country crossing of an electric railway in some respects more nearly resemble the crossings of steam railways than they do the situation in city streets, where persons and teams are constantly traveling across and upon the tracks.

2. If the traveler about to cross the track cannot see an approaching car on account of an intervening bank, he cannot, therefore, in the exercise of ordinary prudence, assume that it is impossible for a car to be behind the bank.

3. In conditions of known peril, prudent men are vigilant for their own safety; and one who drives into a place of known peril as he would into one of assured safety, doing nothing whatever to safeguard himself or to ascertain if the danger be imminent, does not exercise the measure of ordinary care which the law requires. —(Robinson vs. Rockland, T. & C. St. Ry., 58 Atlantic Rep., 57.)

MAINE.—Street Railway Company—Rights and Duties—Collision with Traveler—Speed of Cars—Due Care—Contributory and Contemporaneous Negligence.

1. A street railway company has the lawful right to operate its railway in the location where it has been placed, and run its cars singly or in trains upon the track; but it is its duty to do so, having due regard to the safety, not only of travelers upon the street, but of those who may have occasion to cross the track in driving out from the yards of houses situated along the railway.

2. The speed at which a car or train may properly be run, the kind of control over it, and the degree of watchfulness imposed upon those in charge must depend to some extent upon the surrounding conditions, such as the nearness of the track to the side of the street and to the houses, the likelihood of persons driving out from the yards, and whether the driveways are so situated that persons driving out over them can see or learn of the approach of cars in season, with due care to avoid collision. The railway company and its servants have a right to assume that all such persons will themselves be in the exercise of ordinary care.

3. It is the duty of a street railway company at all times to use due care in view of apparent dangers, and those which may reasonably be expected, so to regulate the speed of its cars, so to have them under control, and so to be on the lookout for a team about to cross that those in the teams, if they themselves are in the exercise of due care, shall not be put in jeopardy.

4. The person in charge of the car must exercise due care and judgment, and the movements of the car must be regulated with reference to the apparent situation. If it be apparent that a collision is likely to occur, it is the duty of the servant in control of the car to be ready to use, and to use, if necessary, and when necessary, all practicable means to prevent it.

5. Applying the foregoing rules to the evidence in this case, held, that the jury were warranted in finding that the defendant was negligent.

6. But the evidence also shows that the plaintiff was clearly negligent, and that his negligence contributed to the injury, and in such a case, where the plaintiff is guilty of contributory negligence, he must fail, unless it appears further that after the plaintiff's negligence, independent of and distinct from any prior negligence of his own, the defendant was negligent, and that this negligence was the proximate cause of the plaintiff's injury. It must appear at some point of time, in view of the entire situation, including the plaintiff's negligence, the defendant was thereafter culpably negligent, and its negligence the latest in the succession of causes.

7. Held, that the defendant's negligence was not subsequent to and independent of the plaintiff's contributory negligence, but that

it was contemporaneous with it, and operated to produce the result in connection with the plaintiff's negligence, and not independently of it; that the plaintiff's negligence actively continued from a point about 20 ft. from the railway track, where he first had opportunity to see the approaching train of the defendant, which was not more than 200 ft. away, to the point of collision; and that it was operative to the last moment, and contributed to the injury as the proximate cause.

8. The doctrine of prior and subsequent negligence is not applicable when the negligence of the plaintiff and that of the defendant are practically simultaneous.—(Butler vs. Rockland T. & C. St. Ry., 58 Atlantic Rep., 776.)

MASSACHUSETTS.—Street Railways—Passengers — Persons Approaching Cars.

1. A pedestrian on the highway, who, for the purpose of boarding it, is approaching a street car stopped to receive him as a passenger, is not, before he actually reaches the car, entitled to the rights of a passenger, even so far as concerns defects in the car, in respect of the extraordinary degree of care due passengers from common carriers, and the railway owes him no duty other than that it owes to any person on the highway.—(Duchemin vs. Boston Elevated Ry. Company, 71 N. W. Rep., 780.)

MASSACHUSETTS.—Carriers—Passengers—Existence of Relation—Failure to Pay Fare—Street Railroads—Death by Wrongful Act—Due Diligence—Construction of Statute.

1. Pub. St. 1882, c. 112, Sec. 212, giving a civil remedy for death by wrongful act, applies only to steam railroads.

2. A passenger on a street car ceases to be such on failing to pay a second fare when due.

3. St. 1886, p. 117, c. 140, declaring that if, by reason of the negligence or carelessness of a corporation operating a street railway, or unfitness or negligence of its servants, the life of a passenger, or of a person being in the exercise of due diligence and not a passenger, is lost, the corporation shall be liable in damages to be recovered in an action of tort, is to be construed as if the proceeding were by indictment, as was the case in all the preceding statutes on the same subject, and the same proof of due diligence is required under this statute as would be required in a proceeding by indictment.

4. Where plaintiff's intestate was carried from defendant's street car in an unconscious condition, and laid by the side of the track, and afterwards run over by a car and killed, he was not in the exercise of due diligence within the meaning of St. 1886, p. 117, c. 140, authorizing the recovery of damages from a street railway company for negligence causing the death of any person not a passenger, being in the exercise of due diligence.—(Hudson vs. Lynn & B. R. Company.)

MASSACHUSETTS.—Personal Injury—Release—Fraud—Evidence—Objection Not Made Below—Damages.

1. Plaintiff, after testifying, in regard to a release signed by her, that defendant's agent gave her an order on a physician, and then handed her the paper to sign, saying to her, "Sign that slip of paper, so that I can show it to the company, so they can see I have sent you to a doctor," and that she signed it without seeing anything on it, and without knowing that she was making a settlement, may testify that just after she signed the paper the agent told her to come to him after she was well, and he would settle all her claims; this having a bearing, at least, on her claim of fraud.

2. The objection that witness' answer was not responsive may not be made for the first time on appeal.

3. Evidence, in an action for personal injury to a woman forty years old, held sufficient, as to the likelihood of her climacteric occurring before she should fully recover, to take to the jury the question of its being an element of damages.—Keefe vs. Norfolk Suburban St. Ry. Company, et al., 70 N. E. Rep., 46.)

MASSACHUSETTS.—Street Railroads—Negligence—Collision—Contributory Negligence—Question for Jury—Damages—Evidence—Expert Testimony.

1. One driving along a street is bound, on turning onto a parallel street railroad track, to look to ascertain whether a car is approaching him from behind.

2. Where one drove on a street railway track to avoid an obstacle, it was not his duty to turn off the track in order to avoid a car coming from behind, until he had passed the obstacle, and was aware of the approach of the car.

3. In an action against a street railway for injuries sustained by plaintiff, owing to a collision between a car and plaintiff's wagon, held, that it was a question for the jury whether plaintiff was guilty of contributory negligence in driving on the track, and whether defendant was guilty of negligence in the operation of the car.

4. Where in an action against a street railroad for injuries sustained by one riding on a wagon, owing to a collision between the wagon and a car, plaintiff testified that he did not interfere with the driving, but trusted himself entirely to the driver, he had a right to have the question whether the driver exercised due care submitted to the jury, the evidence warranting that course.

5. In an action for injuries claimed to have caused appendicitis, a physician testified that he had practiced six years, that he had performed operations for appendicitis from 100 to 200 times, and that his practice was mostly surgical. Held, that he was qualified to testify as an expert as to whether, in his opinion, plaintiff's injuries could have caused appendicitis.—(Sullivan vs. Boston Elevated Ry. Company, Knox vs. Same, 71 N. E. Rep., 90.)

MINNESOTA.—Personal Injuries—Excessive Damages.

Action to recover damages for personal injuries resulting from the admitted negligence of defendants in the operation of a street car system. Held, that the verdict is excessive, and a new trial order, unless respondent consents to a reduction in the amount thereof to $3,500.—(Wadleigh vs. Duluth St. Ry. Company et al., 100 N. W. Rep., 104.)

MISSOURI.—Carriers—Injury to Passenger—Negligence—Jury Question—Instructions—Appeal and Error.

1. In an action against a carrier for injury to a passenger from the negligent starting of the car while the passenger was endeavoring to alight therefrom, evidence examined, and held sufficient to establish a prima facie case entitling plaintiffs to go to the jury.

2. In an action against a carrier for injuries to a passenger, where the court charged the jury that if they found from the evidence the facts therein hypothesized, which were the constitutive facts alleged in the petition, there was liability, and to so determine, an objection that the court thereby submitted a question of law to the jury to be determined as a question of fact is hypercritical.

3. In an action against a carrier for injuries to a passenger, where the instructions given for plaintiff and defendant in their entirety submitted every issue clearly and explicitly, an objection by defendant that a particular instruction given for plaintiff was calculated to mislead the jury as to the decisive issue is untenable.

4. In an action for personal injuries to a married woman, a charge authorizing the jury to allow a reasonable compensation for any permanent injury or impairment of her strength, is not cause for reversal, where the verdict, considering the extent and nature of the injuries sustained, was moderate.—Abbitt et al. vs. St. Louis Transit Company, 81 S. W. Rep., 484.)

MISSOURI.—Street Railroads—Injury to Person Attempting to Board Car—Contributory Negligence—Question for Jury—Duty of Employees in Charge of Car—Conduct of Counsel—Improper Remarks—Duty of Court.

1. Whether a person attempting to board a street car moving at a slow rate of speed is guilty of contributory negligence, precluding a recovery for injuries occasioned by the sudden increase of speed, is for the jury.

2. That a street car was not carrying passengers, but was proceeding to a shed for the night, did not make a person attempting to board it guilty of contributory negligence, unless he knew, or by ordinary care could have known, that the car was not carrying passengers.

3. The employees in charge of a street car are not chargeable with the duty of preventing a person from negligently attempting to board the car while moving.

4. The failure of the court, in expressing its disapproval of objectionable remarks of counsel in his argument to the jury, to use sufficiently emphatic language to destroy any impressions resulting therefrom, is reversible error.—(Leu vs. St. Louis Transit Company, 80 S. W. Rep., 273.)

MISSOURI.—Street Railroads — Crossings — Injuries — Speed—Contributory Negligence—Avoiding Injury—Evidence.

1. In the absence of an ordinance limiting the rate of speed of street cars in a city, evidence that the car by which plaintiff was injured at a crossing ran down a slope in a thinly settled portion, at a speed of from 15 to 20 miles an hour, and slowed down to from 8 to 10 miles an hour when it approached the crossing, was insufficient to show negligence as a matter of law.

2. Plaintiff attempted to cross a street railway track at a crossing as the night was growing dark, and as she entered the street on which the car ran she had a plain view in the direction from which the car approached for 1200 ft. The car was large, and lighted by electricity, and also had a headlight. Plaintiff's wagon was not lighted, and the headlight only lighted up the track for from 50 to 75 ft. in front of the car. The car could have been stopped, at the rate of speed at which it was going, within about 75 feet. Held, that since plaintiff could have seen the car and avoided the injury much sooner than the motorman could have seen plaintiff's wagon in a position of danger, plaintiff was not entitled to recover on the ground that by the exercise of ordinary care the motorman might have seen plaintiff's peril in time to have averted the injury.

3. Though the motorman of a street car could have seen plaintiff at the time she drove into the street from a side street when she was 22 ft. from the track, and when he was 1200 ft. from the crossing, he was entitled to assume that plaintiff at that time and distance would also see the car, and stop before getting into a position of peril.

4. In an action for injuries at a street railroad crossing, evidence reviewed, and held to show that plaintiff was guilty of contributory negligence as a matter of law.—(Petty vs. St. Louis & M. R. R. Co., 78 S. W. Rep., 1003.)

MISSOURI.—Street Railways—Personal Injuries—Collision with Vehicle—Contributory Negligence—Question for Jury—Driving on Track—Lights.

1. A teamster has a right to drive on a street railway track if in doing so he does not unnecessarily interfere with the operation of cars on the track.

2. It was the duty of a street railway company to have its car so lighted as to be seen a safe distance by plaintiff, who was driving on the street, on a dark night, or to sound the gong or give warning of its approach.

3. In an action against a street railway company for injuries to plaintiff, evidence that on a very dark night plaintiff was driving in the street on the left track of the street railway at a rapid speed, when he met and collided with a street car, did not show contributory negligence as a matter of law, but the question was for the jury.—(Buren vs. St. Louis Transit Company, 78 S. W. Rep., 680.)

NEBRASKA.—Street Railroads—Injury to Person on Track—Directing Verdict—Contributory Negligence.

1. In an action by an administratrix to recover damages for the death of the decedent, alleged to have been caused by the negligence of the defendant, it is held, upon an examination of the record, that the court rightfully directed a verdict for the defendant because of the contributory negligence of the deceased.—(McLean vs. Omaha & C. B. Ry. & Bridge Company, 100 N. W. Rep., 935.)

NEW JERSEY.—Discovery—Accounting—Relief in Equity.

A bill filed by complainants, attorneys of this State, against a defendant, a street railway company, set forth that one John Meffert had been injured by the tort of the defendant, and had a right of action against it for damages for his injuries; that he had retained complainants to settle with said company, or to prosecute an action for him for said damages; that, in consideration of their services to be performed, he had assigned to complainants 50 per cent of whatever might be recovered by suit, settlement, or otherwise; that complainants gave notice to said company of such assignment, and thereafter commenced an action in behalf of John Meffert against it; that pending the action the company settled with Meffert for a sum of money, the amount of which complainants had not discovered, and paid the agreed-on amount, and received from Meffert a complete release of his claim. It thereupon prayed for discovery, for an accounting of the money so paid, and for a decree for the payment by defendant to complainants of 50 per cent thereof.

On demurrer to the bill for want of equity, held, that the bill stated no grounds on which the relief prayed could be decreed.—(Weller et al. vs. Jersey City, H. & P. St. Ry. Company, 57 Atlantic Rep., 730.)

NEW JERSEY.—Street Railroads—Injury to Passenger—Evidence—Contributory Negligence—Question for Jury.

1. A passenger upon a crowded trolley car in a city street, desiring to alight therefrom, and being unable to communicate with the conductor, because of the crowd, reached the motorman, and he, in response to the request of the passenger, put on his brake and slowed down the car, whereupon the passenger, while the car was moving slowly, proceeded to step through the gate, which was open, and down upon the step, awaiting his opportunity to alight, when by a sudden jerk of the car he was thrown upon the ground, one foot going under the wheel, whereby he sustained serious injury.

At the trial of a suit for damages against the company, these facts appearing, the court was requested to direct a verdict for the defendant on the grounds of contributory negligence, which request was refused by the trial judge.

Upon review it was held that the action of the passenger did not constitute negligence per se, and whether he was negligent or not was a question for the jury, and that there was no error in the ruling.—(Paganini vs. North Jersey St. Ry. Company,, 57 Atlantic Rep., 128.)

NEW JERSEY.—Street Railroads—Collision with Carriage—Excessive Damages.

1. It is the duty of a motorman upon a street railway, when approaching an intersecting street, to have his car so far under control that he will not endanger the safety of other persons, on foot or in vehicles, engaged in the lawful and customary use of the highway in question.

2. In an action for damages for personal injuries growing out of a trolley accident, the defendant sought a new trial on the ground of excessive damages.

If the disability resulting from the injuries was likely to be permanent, the damages would not be regarded as so excessive as to warrant an interference with the verdict. But it appearing that the trial was brought on so soon after a surgical operation on the patient that sufficient time had not elapsed to enable the physicians to determine as to whether the operation would result in her complete or partial recovery—a result which they regarded, however, as highly probable—and it thereby appearing that justice had not been done by the verdict, it was held that, in the exercise of its sound discretion, it became the duty of the reviewing court to set aside the verdict and grant a new trial.—(Searles et al. vs. Elizabeth, P. & C. J. Ry. Company, 57 Atlantic Rep., 134.)

NEW JERSEY.—Trial—Verdict—Mistake—Correction.

Where the jury fixed on the sum of $1,000 as plaintiff's compensation, but allowed a further $200 under the belief that, to entitle plaintiff to costs in that sum, there must be an allowance to him therefor by the jury, the verdict should be reduced in that amount.—(Toal vs. North Jersey St. Ry. Company, 58 Atlantic Rep., 172.)

NEW JERSEY.—Non-Suit—Denial—Street Railroads—Frightening Horses—Appeal from District Court.

1. Refusal to non-suit for failure of proofs is not error, if the defect was supplied by evidence taken in the progress of the cause.

2. In the trial of an action by the owner of a horse and wagon against a trolley company for damages arising out of a runaway accident caused by the frightening of his horse by some construction cars being propelled upon the streets of a city, the acts of alleged negligence relied upon by the plaintiff were the propelling in the streets of a car of unusual appearance, calculated to frighten horses, and the negligent conduct of the motorman at the time. At the close of the plaintiff's case, a non-suit was asked on the ground that the plaintiff's witnesses agreed that the horse did not show any fright until the cars came within a few feet of the horse, and that the motorman had the car under control, and stopped it before passing the place where the horse stood, and that the use of these cars upon the street at that point was not uncommon. The motion was refused. Later in the trial the motorman testified that he saw the horse begin to show fright, while the cars were 50 yards away, and that he at once stopped the car. Another witness testified that the dirt car at which the horse became frightened was usually run in the rear, but this time it was in front, of the connected cars. Upon review it was held that such error, if any, in the refusal to non-suit, was cured by the later testimony, which made the question one for the jury.

3. In order to maintain an appeal from a district court under the act providing for such appeals (P. L. 1902, p. 565), the record brought up must show, in addition to the other requirements of the act, a case either agreed upon or settled by the judge, including the determination or judgment of the court, and the copies of the case required to be furnished upon the argument must also show that these requirements have been complied with, or the appeal is liable to dismissal.—(Esler vs. Camden & Suburban Ry. Co., 58 Atlantic Rep., 113.)

NEW JERSEY.—Street Railways—Passengers—Personal Injuries—Getting on Car.

Where plaintiff, wishing to board defendant's street car, signaled for the motorman to stop, and the car slowed down almost to a standstill, and, while plaintiff was in the act of stepping on, the motorman called to him to take the next car, and immediately quickened the speed of the car, throwing plaintiff off, the jury was justified in finding negligence on the part of defendant, and that there was no negligence on the part of the plaintiff.—(Schmidt vs. North Jersey St. Ry. Company, 58 Atlantic Rep., 72.)

NEW YORK.—Carriers—Death of Passenger—Street Cars—Negligence—Evidence—Sufficiency.

In an action against a street railroad for death of plaintiff's decedent, alleged to have resulted from the negligence of the street railroad at the time of decedent's attempt to board a car, evidence examined, and held insufficient to support a verdict for plaintiff.—(Fremont vs. Metropolitan St. Ry. Company, 88 New York Suppl., 752.)

NEW YORK.—Master and Servant—Personal Injuries—Street Railways—Rules Limiting Work—Employers' Liability Act.

1. Defendant street railway company had rules relating to operation of its trains, forbidding the pushing of cars except in cases of accident, and then requiring a man on the rear platform. Another rule required the speed of a train to be regulated so that it could be stopped within the distance the motorman could see ahead. Decedent was injured while coupling cars and making up trains, at a station, by another employee on the north car of another train

backing it southward into defendant's train. In an action to recover for decedent's death on the ground of negligence in failing to provide proper rules for the making up of trains, the court instructed that, as a matter of law, the above rules applied to the movement of cars in making up trains, but left the question of the sufficiency of the rules to the jury. There was no evidence that other rules that would afford greater safety were in use under similar circumstances by other roads, nor were experts called to show the necessity or practicability of other rules. Held, that it was error to submit to the jury the question of the sufficiency of the rules.

2. As the employers' liability act (Laws 1902, p. 1748, c. 600) creates no new liability for the failure of an employer to make proper rules and regulations for the safety of employees, an action for such failure is based on the common law.

3. Employers' Liability Act (Laws 1902, p. 1750, c. 600) Sec. 3, providing that an employee shall be presumed to have assented to the necessary risks and no others, and defining what such risks include, and making the question of employee's understanding of such risk a question for the jury, being of general application to all actions by servants against masters for negligence, applies to an action for damages for negligence for failing to make proper rules and regulations for the safety of employees.—(Ward vs. Manhattan Ry. Company, 88 New York Suppl., 758.)

NEW YORK.—Carriers—Injury to Passenger—Dangerous Condition Caused by Mob.

Plaintiff, after purchasing a ticket of defendant railroad company, started toward his train, to reach which it was necessary to pass up a stairway, at the foot of which defendant maintained ticket-chopping boxes. These were located on the floor of a bridge over which defendant had no control, its only right there being to maintain the boxes. The public had a right to pass over this part of the bridge. Before plaintiff reached the boxes he was stopped by a crowd which was held in check by a chain which had been placed cross the foot of the stairway, owing to a blockade on the elevated road above. The boxes were fastened to the cement floor by braces and bolts, and had been in the same position for several years. Plaintiff moved toward the stairway with the crowd, which had broken the chain and pushed over one of the boxes, stumbled over the fallen box, and was injured. The box was so strongly fastened that the bolts had torn through the wood, which was in good condition. Held, that defendant was guilty of no negligence. —Wagner vs. Brooklyn Heights R. Company, 88 New York Suppl., 791.)

NEW YORK.—Street Railways—Personal Injuries—Assault by Conductor—Scope of Employment—Evidence—Sufficiency.

1. In an action against a street railway company for assault by a conductor on a boy trespassing on the cars, no request being made that the court should submit the question as to whether the conductor was acting within the scope of his employment, the question was not raised by defendant's motion for dismissal after the close of all evidence, on the ground that, if plaintiff's claim was true, the conductor's act was willful and without the scope of his employment.

2. Testimony of a street car conductor that there was a rule making it his duty to prevent boys from catching on cars, and that his purpose in what he did was to remove the plaintiff from the car, was sufficient to justify a finding that his act in assaulting a boy who was on, or attempting to get on, defendant's car, was within the scope of his employment.—(Hewson vs. Interurban St. Ry. Company, 88 New York Suppl., 816.)

NEW YORK.—Street Railways—Injury to Workmen Near Track —Contributory Negligence.

Where plaintiff, working on a street, in putting up a fence along a trench which was being dug, was obliged to be dangerously near a street railway track, to the knowledge of the motorman of the car which struck him, the company is not entitled to an instruction, in an action against it for the injury, that he was required to be vigilant to look for cars and avoid them at the time of their passage.—(Hennessey vs. Forty-Second St., M. & T. Ave. Ry. Company, 88 New York Suppl., 728.)

Freedman, P. J., dissenting.

NEW YORK.—Carriers—Injury to Passenger—Negligence—Evidence—Sufficiency.

In an action against a street railroad for injuries alleged to have resulted from the negligent starting of a car as plaintiff was attempting to board it, evidence examined, and held insufficient to support a verdict for plaintiff.—(Mullarkey vs. Interurban St. Ry. Company, 88 New York Suppl., 699.)

NEW YORK.—Street Railroads—Injuries to Passenger—Signal by Another Passenger.

A street railroad company is not liable for injuries to a passenger caused by the premature starting of the car in consequence of a signal given to the motorman by another passenger.—(McDonough vs. Third Avenue R. Company, 88 New York Suppl., 609.)

Ingraham, J., dissenting.

NEW YORK.—Street Railroads—Injuries to Passenger While Alighting—Negligence—Evidence—Sufficiency.

A judgment for plaintiff for injuries alleged to have been sustained by the starting of a street car while she was in the act of alighting after it had stopped on her signal will be reversed, because against the weight of the evidence, where she had no witnesses, and two apparently disinterested witnesses—a lawyer and a policeman—testified that she alighted while the car was moving at about the regular rate of speed, and where she was otherwise contradicted.—(Maloney vs. Metropolitan St. Ry. Company, 88 New York Suppl., 638.)

O'Brien, J., dissenting.

NEW YORK.—Street Railways—Injuries on Streets—Contributory Negligence—Burden of Proof—Right of Way—Proof of Damages.

1. Sending a case against a horse railway company for injuries to a person on the street to the jury on the sole question whether the driver was negligent in driving his horse at a gallop was error, as it relieved plaintiff of the duty of establishing freedom from contributory negligence.

2. Between the blocks of a city a street railway has the paramount right of way over a pedestrian.

3. Proof of damages for injuries should be taken only to the extent of supporting the claim as itemized in the bill of particulars. —(Lejoune vs. Dry Dock, E. B. & B. R. Company, 86 New York Suppl., 749.)

NEW YORK.—Courts—Interpreter—Appointment—Personal Injuries—Accident to Child—Contributory Negligence—Age of Child—Absence of Evidence—Estoppel to Rely On—Dismissal of Complaint—Failure to Procure Interpreter—Remandment to Calendar.

1. At common law, and in the absence of statute, the court has the right, and it is its duty, to appoint an interpreter, when necessary, without the consent of the opposite party.

2. In an action for personal injuries to a child defendant cannot contend, in support of a judgment for dismissal; that the evidence showed that plaintiff was guilty of contributory negligence, and that there was no testimony as to his age which would exonerate it from the consequences of such negligence, where defendant itself prevented the introduction of the testimony of the child's mother as to its age by its refusal to consent to the employment of an interpreter.

3. In an action for injuries to a child, where sufficient evidence had been given to carry the case to the jury on the question of defendant's negligence, it was error for the court to dismiss the complaint, and especially on the merits, before plaintiff had presented all his evidence and closed his case; and, if the presentation of such evidence was rendered impossible by failure to obtain the services of an interpreter, the trial should have been suspended, and the case remanded to the calendar.—(Mennella vs. Metropolitan St. Ry. Company, 86 New York Suppl., 930.)

NEW YORK.—Street Railroads—Injuries at Crossing—Actions —Instructions—Contributory Negligence.

1. Where, in an action for injuries to plaintiff in a collision with a street car as plaintiff was driving across the track at a crossing, it appeared that the wagon and the car came together without any increase in the speed of either from the time when plaintiff was 10 or 15 ft. from the track and the car was 50 ft. away, an instruction that if plaintiff's horse was walking, and the car was 50 ft. away, plaintiff had a perfect right to undertake to cross the track, if the car was going at a reasonable rate of speed, was prejudicial error, as withdrawing from the jury's consideration both the question of defendant's negligence and plaintiff's contributory negligence.

2. Where the driver of a vehicle attempted to cross a street railway track at a crossing, with his horse going at a walk, from a point within 10 or 15 ft. of the rail, when the car was approaching, 50 ft. distant, the question of plaintiff's contributory negligence was not a mere question of arbitrary measurement, but was a question of fact, depending somewhat on the conditions at the time plaintiff actually drove on the track, when he might possibly have avoided the accident, and when it may have been too late for defendant's motorman to have prevented a collision.—(Binsell vs. Interurban St. Ry. Company, 86 New York Suppl., 914.)

NEW YORK.—Municipal Court—Failure of Proof—Dismissal.

Under Municipal Court Act, Laws 1902, p. 1561, c. 580, Sec. 248, subd. 4, providing that an action shall be dismissed, with costs, without prejudice to a new action, where the plaintiff does not prove his cause of action, it was error for the court, in an action for negligence, to refuse to permit plaintiff to discontinue on his failure to prove defendant's negligence, and to order a dismissal of the complaint.—(Mills vs. Interurban St. Ry. Company, 88 New York Suppl., 361.)

NEW YORK.—Street Railroad—Injuries to Pedestrians—Contributory Negligence.

Plaintiff, while attempting to cross a street, was struck by the rear end of one of defendant's cars as she was standing on the crosswalk about 2 ft. from the track while the car was rounding a curve, and was thrown to the ground in front of one of the wheels of a truck approaching behind her in such a manner that the wheel passed over her arm. Before leaving the curb, plaintiff saw the car from 140 to 150 ft. away, the distance from the curb to the car track being about 16 ft. Held, that plaintiff and defendant's motorman were both required to exercise the same degree of care, and that such facts tended to show that both erroneously believed the plaintiff was in a place of safety, and that, if their miscalculation was negligent, it was joint negligence of both, for which plaintiff was not entitled to recover.—Kaufman et ux. vs. Interurban St. Ry. Company, 88 New York Suppl., 383.)

NEW YORK—Carriers—Passengers—Injuries While Alighting—Notice to Conductor.

A passenger cannot recover for injuries sustained in alighting from a street car by reason of the car starting forward after having stopped, in the absence of any notice to the conductor of the passenger's intention to alight.—(McCarthy vs. Interurban St. Ry. Company, 88 New York Suppl., 388.)

NEW YORK.—Street Railroads—Crossings—Collision—Vehicles—Injury to Drivers—Contributory Negligence.

Plaintiff, while driving across a car track, stopped his truck squarely on the track with a car approaching him not more than 30 ft. distant, to enable a loaded truck approaching him at right angles to pass ahead of him. Had plaintiff not stopped, he could have passed in front of the truck and cleared the car; and his only excuse for stopping was that the other truck was loaded, in consequence of which he stopped to give it the right of way. Held, that plaintiff was guilty of contributory negligence, precluding a recovery for injuries in a collision between his truck and the car.—(Heinz et al., vs. Union Railway Company of New York City, 88 New York Suppl., 392.)

NEW YORK.—Carriers—Injuries to Passenger—Actions—Instructions—Limitation to Facts—Degree of Care Required.

1. Conceding that a charge, in an action for injuries to a passenger, that defendant was bound to exercise the highest degree of care for the safety of its passengers, did not state a rule of universal application, defendant, on excepting thereto, should have requested an accurate limitation on the language used to the facts of the case.

2. The rule that a motorman and conductor engaged in the operation of a car are held only to reasonable care applies as to teams on the street, but does not apply as to passengers in the car.—(Zvonik vs. Interurban St. Ry. Company, 88 New York Suppl., 399.)

NEW YORK.—Carriers—Passengers—Street Railways—Contributory Negligence—Boarding Moving Cars—Actions—Verdict—Presumption—Instructions.

1. Whether plaintiff, who was injured while attempting to board one of defendant's trolley cars while it was in motion, but had slackened in speed for him to get on, was guilty of contributory negligence, was a question for the jury.

2. In an action for injuries to a passenger attempting to board a trolley car the verdict must be deemed to have been based on a finding which included the hypothesis suggested by the court in its charge which would sustain the claim of negligence.

3. In an action for injuries to one attempting to board a moving street car, a charge that, if the car slowed down to permit plaintiff to get on, it was for the jury to say whether the motorman saw him, and slowed down in response to his signal, and then started without giving him a reasonable time to get safely on the car, and that, if the motorman saw plaintiff getting on, but nevertheless started off, it would be negligence, but if the motorman did not see him getting on, and did not see his signal, and had no reason to apprehend that he was going to get on, although he had slowed down and started off again, that would not be negligence, was sufficiently favorable to defendant.—(Clinton vs. Brooklyn Heights R. Company, 86 New York Suppl., 932.)

OHIO.—Trial—Instructions—Injury to Employee— Directions of Foreman—Discretion of Employee—Contributory Negligence.

1. A special charge to the jury requested by a party to an action, which is based on the assumption that a material fact exists in the case, but which fact is in dispute between the parties, is properly refused.

2. In the trial of an action brought by an employee against a railway company to recover for injuries sustained by the explosion of a car heater on a passenger coach while he was attempting to thaw out the frozen water pipes while the car was standing in the yards of the company, and where the evidence tends to prove that the heater was without a steam gage, to the knowledge of the employee, and that the explosion was caused by the use of a solid plug in the drum of the heater, instead of a safety valve, which plug was put in by the employee a few days before the explosion by direction of his superior, and where the evidence further tends to prove that the employee was an experienced foreman of car repairs, and familiar with the system of heating used on said car, and with the proper method and means of thawing out the water pipes when frozen, and where the only order from the superior was a telegram to get the car ready for use, to charge the jury, without further explanation, that "if you find at the time of the explosion, and for several days prior thereto, there was no safety valve in the drum of the Baker heater in car 22; that said safety valve had been removed and replaced by a solid plug, and that Rigby knew of these facts when he attempted to thaw out said heater at the time of the explosion complained of; and, further, if you find that said explosion resulted wholly from the fact that said drum had a solid plug, instead of a safety valve—then Rigby would nevertheless be entitled to recover in this action, if you find by a preponderance of the evidence that, in attempting to thaw out said heater as he did, he was acting in obedience to a positive order of his superior; that a person of ordinary prudence would, under the circumstances, have obeyed such order; and that in obeying such order he used ordinary care"—is misleading and erroneous.

3. Where the superior, while absent, sends an order to an employee to perform certain work or duty, but leaves to such employee the selection of the means and manner of performing the service, the doctrine of Van Dusen Gas & Gasolene Engine Co. vs. Schelies, 55 N. E., 998, 64 Ohio St., 298, does not apply.—(Northern Ohio Ry. Co. vs. Rigby, 68 N. E. Rep., 1046.)

PENNSYLVANIA.—Street Railroads — Collision—Negligence—Contributory Negligence.

1. A driver of a carriage saw, on approaching a double-track street railway, cars approaching from both directions, and drove across the far track a short distance ahead of the car on such track, and then pulled onto the other track, so as to meet the other car, moving at a moderate speed, head on, and was injured by the collision. Held, that he was guilty of contributory negligence.

2. In action for injuries by collision with a street car, evidence held to show no negligence on the part of the street car company.—(Lyons vs. Union Traction Company, 58 Atlantic Rep., 118.)

PENNSYLVANIA.—Railroads—Person on Track—Nonsuit.

In an action to recover for personal injuries, the evidence showed that plaintiff was drunk and disorderly on defendant's street car, that he was put off and fell, and ran after the car, and was still running when it got out of sight; and that on the return trip he was run over, when lying on the track in the dark, about 600 feet from the point where he had been ejected. Held, that the company was not liable.—Johnson vs. Chester Traction Company, 58 Atlantic Rep., 153.)

PENNSYLVANIA.—Injury to Employee—Assumption of Risk.

1. An employee contracting for the performance of hazardous duties assumes a risk incident to the obvious dangers thereof.

2. Where a motorman on a single-track road was injured, while attempting to replace at night the trolley, which had slipped from the wire, thereby extinguishing the lights of the car, by being struck by the following car, it was the result of the risk of the employment, for which defendant was not liable, though the single track was operated without signals.—(Simmons vs. Southern Traction Company, 57 Atlantic Rep., 45.)

RHODE ISLAND.—Street Railways—Injury to Person Waiting for Car—Negligence—Evidence—Previous Accidents.

1. In an action for injury to plaintiff, while waiting to board defendant's street car, by the falling of a piece of an electric lamp situate over the street and struck by the trolley slipping from the wire as the car was rounding a curve, evidence that such lamps had previously been broken under like circumstances is relevant and material on the questions of notice and consequent negligence.—(Nelson vs. Union R. Company, 58 Atlantic Rep., 780.)

RHODE ISLAND.—Carriers—Street Railroads—Strike Sympathizers—Injuries to Passengers—Operation of Road—Danger—Notice—Actions—Historical Facts—Judicial Notice.

1. Plaintiff was a passenger on a street car running between two towns, and was injured by being struck by a stone thrown from one of a mob of strike sympathizers. A strike had been on for some days, accompanied with violence; but the mob had been suppressed in one of the towns, and cars were running regularly at the time. There was no indication of danger either to plaintiff or the motorman as the car passed, until the stones were thrown, except the presence of a large number of people on the street. Policemen were present, and, though the preceding car had been stoned, such car was not in sight of the motorman of the car on which plaintiff rode at the time, and the stoning thereof was un-

known to him. Held, that the evidence was insufficient to show notice to defendant that it was dangerous to run cars there by reason of the mob, and hence defendant was not liable.

2. In an action for injuries to a passenger on a street car by stones thrown by strike sympathizers, the court would take judicial notice of the historical fact that on a certain date, which was the date of the injury, the governor had ordered a military force to the town in question to preserve order and restrain violence toward the property and employees of the street railway company, and had issued a proclamation calling upon all persons riotously assembled to disperse.

3. Where a passenger on a street car was injured by stones thrown by strike sympathizers, the fact that on the morning of the day the injury occurred the governor had ordered out the militia to restrain violence toward the property and employees of the street railway company, and had issued a proclamation calling upon all persons riotously assembled to disperse, was not notice to the street car company that it was dangerous to run its cars, but was rather an invitation to operate its road under the protection of the militia.—(Bosworth vs. Union R. Company, 58 Atlantic Rep., 982.)

RHODE ISLAND.—Carriers—Injuries to Passengers—Derailment—Res Ipsa Loquitur—Evidence.

1. An injury to a passenger by the derailment of a street car is of itself prima facie evidence of negligence on the part of the railroad company, which the latter is bound to rebut by proof that the accident was not due to the carelessness of its employees, in order to escape liability.

2. Where a passenger was injured by the derailment of a street car at a curve, alleged to have been caused by the excessive speed of the car when entering the curve, evidence of experiments conducted under similar conditions for the purpose of determining whether the car would leave the track at the same curve when running at its maximum speed was admissible.

3. A passenger on a street car was injured by derailment on a dark evening. There was evidence that at the time of the occurrence a strike was in progress among the carrier's employees, and that obstructions had been placed on the track at various points, and several witnesses testified that the derailment was accompanied by a jolt as if an obstruction had been run over. A spike was picked up from the track near the place of the accident, which had the appearance of having been run over, and it was also proved that the car running at its maximum speed could not have been derailed at that point by its speed. Held, that the evidence sufficiently rebutted the presumption of negligence arising from the happening of the accident.—(Cheetham vs. Union R. Company 58 Atlantic Rep., 881.)

TENNESSEE.—Street Railroads—Persons on Street—Injuries—Negligence — Definition—Ordinances — Reasonableness—Violation—Negligence Per Se—Contributory Negligence—Question for Jury—Instructions—Requests.

1. An instruction defining negligence as the neglect to use ordinary care or skill toward a person to whom the defendant owes the duty of observing ordinary care and skill, by which the plaintiff, "without negligence on his part proximately contributing to produce the accident," has suffered injury to his person, while objectionable for containing the clause quoted, was not prejudicial to defendant on that ground.

2. Though the act of a person in crossing or driving along the side of a street car track in front of a car near enough to be struck might have been negligent, yet, if the motorman observed such negligence, or could have observed it by the use of ordinary care, when the peril of the collision became imminent, and might have avoided its effect by due care in time to prevent an accident, and failed to do so, the railway company would be liable for injuries sustained in such collision.

3. Where city ordinances required drivers of street cars to keep a rigid lookout for all teams, etc., on or moving toward the track, and to stop cars in the shortest time and space possible on the first appearance of danger, and limited the speed of cars to 15 miles per hour, a violation of such ordinances was negligence per se, which would render the company liable, if such negligence was the proximate cause of the accident.

4. A city ordinance requiring street car drivers to keep a rigid lookout for teams, persons, etc., on or moving toward the track, and, on the first appearance of danger to such a team or person, to stop the car in the shortest time and space possible, should be construed to require the car to be stopped only when it is perceived that a collision is imminent, and, as so construed, was not objectionable as unreasonable.

5. Where, in an action for injuries to plaintiff by being struck by a street car approaching him from the rear while he was driving along the street sufficiently near to the track to be struck, there was no evidence that the motorman applied the brakes in order to prevent a collision, but only that he sounded the gong and reversed the current when he was so near that a collision was unavoidable, it was error for the court to charge that if the motorman failed to apply the brakes and sound the gong, or give other signal and use other means in his power to stop the car and prevent an accident, when danger became imminent, he was guilty of negligence, since whether, in the exercise of ordinary care, he was required to use any particular appliance or appliances to stop the car, was for the jury.

6. While the question of contributory negligence in an action for injuries is always one of fact for the jury, the trial judge, in a proper case, may instruct the jury that particular conduct on the part of the plaintiff would be negligence per se.

7. In an action for injuries to the driver of a vehicle by being struck by a street car approaching him from the rear, evidence as to plaintiff's contributory negligence held to require the submission of such question to the jury.

8. In an action for injuries, an instruction permitting the jury, in its discretion, to consider plaintiff's contributory negligence in mitigation of damages, in case such negligence was the remote cause of the accident, was erroneous, since such was the jury's duty as a matter of law.

9. In an action for injuries, it was error for the court to refuse to charge that if the jury believe from the evidence that plaintiff was guilty of negligence which, combined with defendant's negligence, produced the accident, so that both acts constituted the proximate cause of the injury, then the negligence of the plaintiff however slight, would bar recovery.

10. Requested instructions covered by the general charge may be properly refused.—(Memphis St. Ry. Company vs. Haynes, 81 S. E. Rep., 374.)

TEXAS.—Carriers—Alighting Passengers—Negligence—Instructions—Assumption of Facts.

1. In an action for injuries to a street railway passenger, it was not error for the court to assume in its charge that plaintiff was a passenger, although he had not paid his fare when he sought to alight, where the evidence was uncontroverted that plaintiff boarded the car intending to pay his fare, and had the money with him to do so.

2. In an action for injuries to a street railway passenger while alighting, it was not error to assume in the charge that defendant was guilty of negligence in not stopping the car, where the uncontradicted evidence showed that the signal to stop was given, and the speed of the car was first lessened, and then began to increase.—(Dallas Rapid Transit Ry. Co. vs. Payne., 78 S. W. Rep., 1085.)

TEXAS.—Street Railway—Collision with Team—Contributory Negligence—Burden of Proof.

Plaintiff's boy, twelve years old, while driving a closed milk wagon having a window in front and a door on each side, was injured by an electric car running on E. Street striking the wagon at a street crossing. Plaintiff's evidence was that the car was going with unusual speed. The boy testified that when on E. Street he looked out of the front and sides, and saw and heard no car, and did not know of its presence till it struck. He also stated that there was nothing to obstruct his view, and that if he had been keeping a lookout he would have seen the car. Held, that plaintiff's evidence did not present contributory negligence as a matter of law, which was necessary to make improper a charge that the burden of proof on the issue of contributory negligence was on defendant.—(El Paso Electric Ry. Co. vs. Kendall, 78 S. W. Rep., 1081.)

TEXAS.—Carrier—Duties to Passengers—Instructions.

1. An instruction, in an action against a carrier for injury to a passenger, that it was defendant's duty to provide reasonably safe cars, and to cause them to be operated in a reasonably safe manner, is erroneous, it being its duty only to exercise a high degree of care to furnish safe cars, and operate them safely.

2. Error in an instruction is not cured by its being followed by instructions in conflict therewith.—(Citizens' Ry. Co. vs. Sinclair, 81 S. W. Rep., 329.)

TEXAS.—Carriers—Street Railways—Injuries to Passengers—Damages—Excessiveness.

Plaintiff's wife, a passenger on a street car, was injured by flames emanating from a burning house close to the tracks by the motorman negligently propelling the car past the same. Her face was burned and blistered about the left eye, causing inflammation to set in and the eye to close, which continued for a considerable period. She did not know the extent of the fire, and when she felt the flames she darted down between the seats in an endeavor to protect herself and infant son, and in so doing wrenched and strained her back. Held that a judgment in favor of the plaintiff for $900 damages was not excessive.—(Citizens' Ry. Co. vs. Jones, 81 S. W. Rep., 558.)

TEXAS.—Carriers—Street Cars—Injuries to Passengers—Pleading—Allegations of Negligence—Evidence—Instruction.

1. Where, in an action for injuries to a passenger, the case was tried on a second amended petition, which alleged negligence in general terms, which would have been sufficient if alleged in the original petition, it was not defective by reason of the fact that the original and first amended petition alleged specific acts of negligence, since, under the general allegation, plaintiff was entitled to prove any negligence, including that previously alleged.

2. In an action for injuries to a passenger, the fact that he has knowledge of the particular act of negligence which caused the injury does not require him to allege such act specifically, nor deprive him of the benefit of the rule that in such action a petition alleging negligence in general terms is sufficient.

3. Where, in an action for injuries to a passenger on a street car, plaintiff and another witness testified that at the time of the accident the rear end of the car was elevated, and when it fell back it was derailed, an instruction that if plaintiff was injured by the "wreck and derailment," and such "wreck and derailment," if any, was the result of defendant's negligence, and was the proximate cause, etc., plaintiff was entitled to recover, was not objectionable on the ground that there was no evidence authorizing the court to submit the question of plaintiff's injury by reason of the "derailment" of the car.—(San Antonio Traction Company vs. Williams, 78 S. W. Rep., 977.)

WASHINGTON.—Wrongful Death—Carriers—Street Railroads—Passengers—Operation of Cars—Crowding—Riding on Front Platform—Contributory Negligence—Duty of Carrier—Providing Seats—Evidence—Witnesses—Experts — Instructions—Damages—Excessiveness.

1. Where a passenger on a street car was killed by being thrown from the front platform, on which he was standing, as the car was alleged to have rounded a curve at a high rate of speed, a witness, who had been a motorman over the same line for six or seven months, was familiar with the speed of cars, and the road throughout its entire length, and was acquainted with the particular curve, and who stated that, in his judgment, the car was running through the curve at the time of the accident at between 7 and 8 miles an hour, was competent to state at what rate of speed the car ought to have been run into the curve in order to be operated with safety to passengers thereon, and whether a speed of 6 or 8 miles an hour was safe.

2. Where, in an action for death of plaintiff's husband, plaintiff had been associated with him in the business and kept the books, she was entitled to testify as to her husband's earnings in his business, independent of the books so kept.

3. In an action for death, evidence as to decedent's earnings immediately prior to his death was admissible as tending to show his earning capacity.

4. In an action for death of a passenger by being thrown from a street car as it rounded a curve, evidence as to the experiments subsequently made with the same car, running through the same curve, was incompetent, where the conditions were not similar to those existing at the time of the accident, though more favorable to decedent's case.

5. Where evidence offered as to the results of experiments was excluded, remarks of the court with reference thereto, stating the reason why he thought the same inadmissible, were harmless.

6. An objection that remarks of the court on the exclusion of evidence were objectionable cannot be reviewed on appeal in the absence of an exception thereto taken at the trial.

7. While it is not negligence per se for a street car company to fail to furnish a seat for each of its passengers, where seats are not furnished, and passengers are permitted or required to stand on cars, greater care is required in the operation thereof than where all of the passenges are provided with seats.

8. It is not negligence per se for a pasenger on a street car to ride or stand on the platform.

9. Where, at the time deceased boarded a street car from which he was subsequently thrown, there was but little standing room inside the car, and a seat in the front vestibule, which was 7 ft. 9 ins. long, was occupied by four persons, two of whom nearest deceased being ladies, and two or three other passengers were standing on the front platform, it was not error, in the instructions, to assume that there was evidence that deceased was compelled to stand on the car or on the platform.

10. Where, in an action for death of a passenger by being thrown from the front platform of a street car, plaintiff alleged negligence, in that the car was run at a high and dangerous rate of speed through a curve, and that defendant failed to provide railings or gates to prevent passengers from falling or being thrown from the cars, it was not error to refuse to charge that the company was not bound to provide gates, and, if deceased entered the car on the front platform, the fact that there was no gate closed behind him would not constitute negligence, and to charge that if deceased was permitted to ride on the platform, and defendant negligently failed to provide any gate, railing, or other protection, and thereby the car was rendered unsafe, and defendant permitted the car to become overcrowded, and permitted deceased to be crowded by other passengers on the platform, and the car ran into a curve at the place of the accident at a high rate of speed, without warning to deceased, causing him to be thrown therefrom, plaintiff was entitled to recover.

11. In an action for death of plaintiff's husband, it appeared that deceased had been in the photograph business for ten years, during which time his accumulations consisted of a small building on leased land, used as a photograph gallery, in which plaintiff and deceased lived, together with a photographer's equipment and supplies. Platintiff and her husband had no children, and plaintiff had been with her husband in the business, which earned a net annual income of $2,000. Plaintiff continued the business after her husband's death, but her earnings therefrom were not shown. Held, that a verdict of $20,000 for the death of her husband was excessive, and should be reduced to $10,000.—(Halverson vs. Seattle Electric Company, 77 Pac. Rep., 1058.)

WASHINGTON.— Carriers — Injury to Passenger — Release — Fraudulent Representations—Jury Question—Defense—Return of Amount Paid for Release—Verdict—Damages.

1. In an action against a street railroad for injuries to a passenger caused by a collision, to which the company pleaded a release by plaintiff, who was also an employee of the defendant at the time of the injuries, evidence examined, and held that whether the release was obtained by fraudulent representations of the defendant's physician and representatives was a question for the jury.

2. Where a release of a claim for injuries caused by negligence is obtained by fraud, the release is no defense to an action for damages caused by the negligence.

3. Where, at the time of fraudulency obtaining a release of a claim for injuries caused by negligence, a sum of money is paid as the purported consideration of the release, the return of the sum so paid prior to bringing an action for damages for the negligence is not necessary to the maintenance of the action; an allowance by the jury of the sum paid in returning the verdict being sufficient.

4. Where an employee of a street railroad is injured while riding as a passenger on its lines, and a release of a claim for damages is procured from him by fraudulent representations of the defendant's representatives, the fact that he was induced to continue in the service of the defendant after the release was obtained—the defendant paying him his wages all the time—does not militate against his recovery of damages for the injuries.—(Bjorklund vs. Seattle Electric Co., 77 Pacific Rep., 727.)

WISCONSIN.—Carriers—Injuries to Passengers—Time to Alight—Premature Start—Actions—Instructions—Verdict—Weight of Evidence—Review.

1. In an action for injuries to a passenger by the alleged premature starting of a street car while she was endeavoring to alight, a verdict in favor of plaintiff, sustained by the trial court, held not so contrary to the weight of evidence as to justify reversal of a judgment based thereon.

2. Where, in an action for injuries to a passenger, the court positively charged that if plaintiff undertook to leave the car after it had started and when it was in actual motion she could not recover, an instruction that if a reasonable stop was made, if plaintiff had given no notice that she desired to alight, if after the car started it occurred to plaintiff that she ought to have gotten off, when she attempted to alight while the car was in motion, and by reason thereof she fell off and was injured, she could not recover, was not objectionable as including elements not necessary to be passed on to acquit defendant of liability.—(Champane vs. La Crosse City Ry. Co., 99 Northwest Rep., 334.)

WISCONSIN.—Street Railroads—Death by Wrongful Act—Collision at Crossing—Willful and Wanton Injury—Evidence—Sufficiency—Pleading—Proof.

1. In an action against a street railway company for wrongfully causing the death of plaintiff's intestate, by wantonly and willfully causing its car to collide with his vehicle, drawn by a runaway team across a public crossing, evidence examined, and held to require submission to the jury of the issue as to defendant's wantoness and willfulness.

2. Where plaintiff in an action for wrongfully causing death alleges that it was caused by defendant's wanton and willful misconduct, he cannot recover on proof of mere negligence.—Wilson vs. Chippewa Valley Electric Ry. Company, 98 N. W. Rep., 536.)

LONDON LETTER

(From Our Regular Correspondent.)

A welcome announcement which has recently been made, is that the City & South London Railway has at last received powers, and has, in fact, placed contracts for the construction of the extension of its railway from Islington to Euston. Most of the readers of this paper are probably aware that Euston Road accommodates the termini of the three most important railways extending northward in Great Britain, namely, the London North Western Railway station at Euston Square, St. Pancras station of the Midland Railway Company a little further to the east, and almost adjoining that station, just a little further to the east, King's Cross station of the Great Northern Railway Company. Most of the readers of this paper also probably know that from any part of London to the vicinity of these important railway stations there has been practically no possibility of getting transportation, except by cabs, as a 'bus journey to that vicinity is altogether too tedious, and in many cases implies numerous changes. The City & South London Railway, the first tube railway in Great Britain, had a sphere of usefulness when it was constructed from the Bank southward to its terminus at Clapham. It increased its usefulness when it got its extension to Moorgate, and again made a distinct step in advance when it secured its extension from Moorgate to the Angel at Islington. There would have been no great object, however, in going to Islington had it not been for the hope that some day the company would be able to get an extension to Euston, so as to place the city portion of London, and the whole of the southern portions of London served by this railway, in connection with this important railway center in Euston Road. The company should therefore be heartily congratulated upon this distinct advance in the right direction, and it might also be pointed out that when this extension is completed it will also be extremely useful for passengers from the North going further south (and vice versa), as there are exchange stations at London Bridge for the London, Brighton and South Coast and the South Eastern Railways, and also at the Elephant and Castle for the Chatham & Dover Railway. The scheme will serve to materially improve the transportation problem of London, and in a year or two, when the other electric railways and tube railways which are now under construction are completed, London will have little to be desired in the matter of rapid and cheap transportation.

The Birmingham Corporation Tramways has inaugurated another of its tramway routes, which has been recently converted from steam haulage to electrical overhead system. The new cars are of the usual type, and are constructed to carry twenty-six passengers outside and twenty-two inside, but on closer examination it is found that they possess certain novelties. The car rests upon the Conaty Lycett patent radial truck which, it is claimed, is pracularly effective in negotiating sharp corners. They have also been fitted with Raworth's patent regenerative control system, which is claimed regenerates and returns about 20 per cent of the power when the car is traveling down hill.

The booming of the motor omnibus still continues, and as suggested in my letter of last month, this booming was the prelude to the flotation this month of, at least, two motor omnibus industrial companies with capital varying from £100,000 to £500,000. There is no doubt, however, but that the amount of booming which this industry has had in the press lately, has had an appreciable effect upon the tramway committees of various cities, and many of them are considering the adoption of the motor omnibus in some modified form. Some of the smaller schemes for the adoption of electric cars have even been postponed until a more thorough investigation has been made into the costs of operation of motor omnibuses, and it looks as if one or two would be abandoned in favor of the omnibus. Even in one of the sections of London where the trams are controlled by the Shoreditch Borough Council, though the cars are operated by the North Metropolitan Tramways Company, the question of motor omnibuses is receiving great attention, while in Liverpool also one of the members of the City Council has brought forward a motion urging that the Tramways Committee should consider and report upon the desirability of introducing self-propelled motor cars and omnibuses to work in conjunction with, or apart form, the present system of electric cars. This action has, of course, aroused the Liverpool press to interview the engineers in Liverpool who are supposed to be experts in traction affairs. One of the advocates of the motor 'bus places the cost of operating an electric tramway from 6d. to 7d. per mile, while he claims that a motor omnibus can be operated at 9d. per car-mile. He takes also the tramway receipts as averaging about 10d. per car mile, while he claims that motor omnibuses earn 15d. per car mile.

Another titanic battle is now being fought out before the special committee appointed by the House of Lords regarding the subject of electric power supply for the whole of the City of London. Recently, two companies have been organized for the purpose of supplying electric energy in bulk to London, the more important of which is the scheme of the Administrative County of London & District Electric Power Company. We have already referred to this company in this column, and it has evidently been promoted by those gentlemen who have been interested largely in the Tyneside Electrical Supply Company, which has made such a great success of the business of supplying power to the various shipbuilding industries on the River Tyne. This company proposes to set up large generating stations at Greenwich, Silvertown and Fulham, and claims that as these stations will be of enormous capacity, and will be equipped with the very latest type of apparatus, they will be able to produce current and sell it at such low cost that even the already existing municipal authorities and private companies will find it to their advantage to buy their current from them. The company has a capital of £5,000,000, and is prepared to bind itself to sell electric current to the whole of London and neighboring areas at a maximum schedule of from slightly over three farthings a unit to three halfpence, and they also bind themselves not to pay more than 8 per cent dividends until the price of power has been reduced below this schedule. Naturally both of the bills referred to above are being vigorously opposed before the special committee, and it is stated that 257 petitions have been lodged against the two bills referred to above and one or two others of minor importance. There are at present in the County of London some fifteen Borough Councils and thirteen private companies engaged in the supply of electric energy, and among them there is invested at present something like £16,500,000. The London County Council is also naturally interested in these bills, and is lending all its weight to oppose them, regarding these bills as a serious menace to existing and future electrical supply undertakings, and making the broad claim that the Council itself should be the authority for generating electricity in bulk in London.

The annual staff dinner of Dick, Kerr & Company, Ltd., of London, was held this month at the Holborn Restaurant, John Kerr, Esq., M. P., the chairman of the company, occupying the chair. After the usual loyal toasts, Mr. Kerr proposed the toast of the staff, which was replied to by Mr. W. Rutherford, manager of the company, and Mr. J. Conner, manager of the works at Preston. The toast, Dick, Kerr & Company, Ltd., was proposed by Mr. J. B. Concannon, who is well known in connection with many tramway enterprises, the response being made by Mr. R. H. Prestwich, chairman of the Electric Railway & Tramway Carriage Works. The toast to the visitors fell to Mr. D. C. Ellis, one of the directors of the company, and was replied to by Mr. Tom G. Clare. Though not on the toast list, perhaps the most important toast of the evening, judging by its reception, was the toast of Mr. G. Flett, managing director of the company, which was proposed in very warm and affectionate terms by Mr. Concannon. In responding, Mr. Flett stated that he considered the success which Dick, Kerr & Company had achieved in the past few years, since it had entered the electrical manufacturing business, to be directly traceable to the unanimity in the work of the staff, and if any credit extended to him it was in having been able to surround himself with such an efficient staff. He made the interesting statement also that he considered that though in the past few years, and especially the past year, the competition in this business in Great Britain had been extremely keen, he looked for it to be even keener for the next year or so, after which it is to be hoped that things would take a better course. Sandwiched in between the speeches was a most enjoyable programme of song and natural magic, etc., which enabled every one to pass a very pleasant evening.

The contract for the extension of the London United Tramways which comprises two distinct sections has been awarded to J. G. White & Company, of London. The first section is in Kingston, Surbiton, Malden and Wimbledon districts. The total route length of this line is about 10¼ miles, and the length of single track is about 18¾ miles. The second section is in Hanwell and Brentford, starting from a junction with existing tramways in High Street, Brentford, The route length of these lines is about 2⅝ miles, and the length of single track 5⅛ miles. The amount of this contract is about £165,000. The track will consist generally of No. 3 B. S. rails, with cross girders spaced 9 ft. apart throughout, and the joints are supported by anchors of H section, secured to the rails with bolts and clips. The concrete underbed is 6 ins. thick finished off with a layer of 1 in. fine concrete, and over this a floating coat of 1 in. cement and sand to form bed for wood paving. The overhead construction is span wire throughout; the poles being 33 ft. long, and the ornamental character of the remainder of the L. U. T. will be preserved on the new sections. The trolley wire will be No. 00 B. & S. gage grooved copper wire, and will be supported by mechanical ears. The height of the trolley wire above rail level will be 23 ft., which is greater than is usual, owing to special London conditions.

A question was recently put to the President of the Board of Trade whether, under the proposed electrical equipment on the District Railway, there will be only one motorman to each train, and whether, having regard to the safety of the public, he would take steps to secure that there be two motormen to each train. Mr. Gerald Balfour says in his printed reply that he is informed by the railway company that every electrical train, whether of seven, four or three cars, on the District Railway would, in addition to the motormen, have one or more men who would be thoroughly instructed in the control of the motors. He adds that the effect of the withdrawal of the motorman's hand from the lever would be simply to cut off the current and stop the train. As a further precaution, if a train passed a signal set at danger, it would be instantly stopped through the automatic application of the brakes. He saw no reason to take any action in the matter.

In answering a question in the House of Commons relative to accidents from the live third-rail on electric railways, Mr. Gerald Balfour, president of the Board of Trade, stated that on the Lancashire & Yorkshire and London & North-Eastern railways, nine fatal and twenty-two non-fatal accidents have occurred through contact with the electrically-charged rail, including eight fatal and eight non-fatal accidents to trespassers, and one fatal and eleven non-fatal accidents to railway servants. No accidents from contact with the rail in question have been reported to the Board of Trade on any of the other lines which have recently been equipped for the use of electrical power in place of steam, and no such fatal accident has, it is believed, occurred on any of the tube railways. The number of non-fatal accidents of this description on tube railways, some of which have been opened now for a considerable period, cannot be given, as no separate record of such accidents has been kept, but the number, if any, must be very small. Recommendations as to the steps to be taken to prevent the occurrence of accidents of this character have been made from time to time to the railway companies and have been adopted by them; and the matter is one that receives unremitting consideration from the inspecting officers of the department in the execution of their duties.

An amicable arrangement has now been arrived at by which the St. Annes and Lytham Tramways Company will obtain running powers over certain portions of the Blackpool Corporation's lines. In the first instance, it may be remembered, the company applied for running powers generally in Blackpool, and stated that it particularly wished to go along the promenade as far as the North Pier. The corporation, however, intimated that it would strongly resist any such demand. After somewhat lengthy negotiations, the result is that satisfactory limitations have now been agreed upon. The company has not been granted running powers on any portion of the Promenade. It will, however, be given the use of the Station-road line on an annual rental of £250 a year. It will thus be able to "pick-up" from the Promenade opposite the Victoria Pier, and this concession should lead to a very big increase in passengers.

The completed portion of the system of electric tramways in course of construction by the Pontypridd District Council was recently opened for traffic.

Mr. Ernest Hatton has been appointed general manager of the New Castle Corporation Tramways. Mr. Hatton came from Wallingford, and laid down a system of tramways in Liverpool at the age of twenty-three years. He went from Liverpool to Birkenhead, and thence to Salford at the time when the Salford Corporation took over the horse tramways from a company. He transferred the whole system without the assistance of any expert into the present electrical system, building car sheds and placing the overhead equipment. Mr. Hatton expects to be able to save the Newcastle Corporation a very large sum of money by changes in its present method of operation.

Mr. William Grant, manager of the Rotherham Corporation Tramways, has been appointed manager of the tramways of Ayr.

The Board of Trade has issued a new regulation in regard to the adoption of top covers on narrow-gage tramcars. The Board points out that it will not approve of such tops on cars run on tracks measuring 3 ft. 6 ins. or less in width. Among tramway managers the matter is regarded very seriously, and the Executive Committee of the Municipal Tramways Association had the subject under consideration in Birmingham a day or two ago, and decided to make a strong representation to the Board of Trade in reference to the new regulation.

A Parlimentary Return recently issued on Tramways and Light Railways is of interest in showing how electric traction is superseding steam and horse working on the roads. The return gives the following table, which relates to an electric period, as compared with 1898, which was a maximum steam period, and 1879, which was almost wholly a horse period:—

	1903-4 Electric Period	1898 Steam Period	1879 Horse Period
Capital expenditure per mile of single track open:			
Lines and works	£11,780	£7,770	£7,840
All items	16,018	10,469	9,877
Percentage of net receipts to capital outlay	6.27	6.38	3.97
Percentage of working expenditure to gross receipts	66.15	76.93	83.81
Passengers carried per mile of route open.	977,951	806,703	469,641
Passengers carried per car-mile	9.23	9.48	7.77
Average fare per passenger	1.11d.	1.23d.	1.84d.
Amount paid in relief of rates out of profits of undertakings worked by local authorities	£207,087	Not given.	Not given.

The number of undertakings dealt with is 312, of which 162 belong to local authorities, who have spent £28,060,524 thereon in connection with 1147¾ miles open for traffic. Of tramways and light railways, other than belonging to local authorities, there were 150, on which £18,390,920 had been spent, for 692 miles of road. The total mileage was thus 1840, and of this no less than 1462 miles were worked electrically, 108¾ miles by steam, and 235¼ miles by horses. Passengers to the number of 1,799,342,673 were carried during the year 1903-4, and the gross receipts were £8,604,834. Expenses came to £5,692,774, leaving £2,912,110 as net revenue.

The Stirling Town Council, which has been considering for a considerable time proposals to acquire the existing tramway between Stirling and Bridge of Allan, has decided that the time was not opportune for putting upon the ratepayers of Stirling the large responsibility which such an undertaking would involve. The Council agreed to give every facility to any private company that might take up the work. A. C. S.

PARIS LETTER

[*From Our Regular Correspondent.*]

Although the Paris Metropolitan Railway was opened for service on July 19, 1900, the official inauguration was held last month, that is, on March 11, 1905. However, late inaugurations have the advantage that at them facts instead of unrealized hopes can be discussed. On Saturday afternoon March 11, a special train draped with flags, and brilliantly illuminated, proceeded the whole length of line 3, transporting some 400 passengers, among whom were the minister of public works, presidents of the municipal and general councils, prefect of the Seine and prefect of police, the principal administrative and executive officers of the Metropolitan Railway Company, and the various deputies and senators of the Seine department. A visit was also made to the St. Fargeau workshops of the company. Everything passed off satisfactorily. The train was composed of the new multiple-unit train control equipments, some 90 of which have been furnished recently by the French Thomson-Houston Company. The minister of public works distributed a number of decorations and medals among the principal officers of the Metropolitan Company.

The question of repurchase of the French railways by the State, which comes up periodically with change of governments, has again come to the front. The minister of public works has given an evasive answer regarding his views, awaiting the conclusions of a committee appointed to report on the question. M. Rouvier, the new head of the French Government, has already made known his unfavorable views regarding the repurchase. The matter has especial interest to the Ouest Railway, which would be the first to come under the new régime.

In Italy on the other hand, the repurchase of the principal railways by the State has already formed the basis of a project now before the Italian Government. The scheme includes the acquisition of three out of four of the principal railways, the Mediterranean, the Adriatic and the Sicilian, of a total length of 10,560 km. The total expense, including a credit for putting the lines into proper state of repair, is estimated to be about $200,000,000, which the government expect to be able to liquidate without having recourse to a loan. The Italian press is not very enthusiastic over the scheme, which must, however, be finally decided within the next four months, at which date the contracts with the railway companies terminate.

Meanwhile, in France, the various steam light railways and tramways, of which there is a considerable number, are gradually being replaced by electric power. The steam line between Versailles and Meulun is about to be transformed and extended as is also the steam line between Paris and Versailles. The decision to electrify the Paris-St. Germain line was reached some months ago. All these are well established light steam railways, built many years ago, and all paying fair dividends under the present régime.

In a general way the electric tramways are maintaining their dividends for the past year, and in some instances are increasing them. Very few have as yet held their annual meetings, as these, as a rule, occur during the end of March, or in April. The Rouen Tramways Company has increased its dividend from 5 to 6 per cent, and it is anticipated that several other provincial tramways will follow suit.

The Metropolitan Railway, of Paris, receipts for the present year exceed those of the same period of 1904 by Frs 1,391,700, and it has carried over eight million passengers more than the corresponding period of 1904. This is, however, not surprising in view of the opening of line 3. The average daily number of passengers transported exceeds 450,000.

Recently the Metropolitan Company has been cited before the courts for permitting overcrowding on its cars, and the court found that the company, in the person of the "chief d'exploitation," were in principle culpable of negligence in the matter. The case was of course a test one by the municipal authorities.

In Italy the continued activity in respect to the formation of new societies and companies for electric traction calls for attention. More than one rather important scheme has been approved by the government, which has given substantial support to the promotion by means of an annual subsidy per kilometer, varying from 3000 to 4000 liri, for the term of 70 years. Needless to add, these lines are to be operated by electric traction.

The direct current 600-volt line existing between Gallarate and Barese is to have its track doubled over a portion of its length, owing to traffic exigencies. Another notable event is the final completion of the Varese-Luino three-phase line, which has long been deferred owing to various complications. Trial trains have been run over the line and the inauguration will probably take place in the near future. On the Milan-Monza line, where accumulators were employed for some years to run a series of cars on this line, the experiment has been definitely abandoned, as financial results were not encouraging. The Edison electric tramway of 15 km long serving this route aided considerably in bringing this decision about. Finally, the line from Naples-Resino, of a length of 35 km, has been successfully inaugurated. M. V.

THE ELECTRIC RAILWAYS OF MICHIGAN

Through the courtesy of Malcolm J. McLeod, commissioner of labor of Michigan, the Street Railway Journal has been permitted to make extracts from the report of the department on street railways, which is now in press. The information solicited by the department covered the names of lines, location of offices, names and addresses of managers, capital stock, whether road is operated in city or is interurban in character, number of miles measured as single track, number of miles that are interurban, amount expended for permanent improvements during the past year, receipts from passenger traffic in past year, receipts from foreign traffic during same time, all other receipts, number of cars, both passenger and freight, price of single fare and rates when purchasing tickets, whether transfers were given, total number of passengers carried during the year and average fare for each passenger carried. In addition to this a classified list of employees is given, with the average hours worked per day for each class and the average number of hours constituting a day's work. The financial statistics are all given in the aggregate. The report is the first of its kind ever published in relation to the railways of the State.

The statistics show there are 25 separate electric railways now being operated in the State. These have a total of 1158 miles of single track. The capital stock of the companies is given at $34,075,000, of which $1,600,000 is reported as preferred stock. The actual value of the roads with their equipments approximates $45,000,000. Last year 18 of these lines spent $1,682,718 for permanent improvements, 10 of them extending their lines to the extent of over 62 miles.

During the year 151,001,029 passengers were carried on these lines, the sum of $6,581,275 being received for passenger traffic alone. The average rate of fare for all passengers carried was .04 1-3 each. During this same period the receipts from freight traffic were $229,612, and $99,314 was received from other sources, making the total receipts of the 25 lines $6,910,201.

The combined lines operate 1494 cars, of which 1352 are for passenger traffic. In furthering the conveniences of travel 17 of the lines give transfers, the lines that do not being the ones operating outside the cities, or where the lines are continuous, so that a transfer is not needed. On five of these lines transfer tickets are given where one transfer has already been made. On most of the interurban or county lines tickets are sold at the rate of one and one-half cents per mile, but on almost every line reductions are made when tickets are purchased in bulk. Then, too, special school tickets, laborers tickets, etc., are a feature of a number of lines.

At the time the canvass was made the lines were employing in the aggregate 5144 people who were paid an average daily wage of $1.89, ranging from $4.16 for a division superintendent to $1.12 for the most common labor. Among the classified employees the wages of a large per cent are computed by the hour, none of the classifications averaging more than 11 hours per day, the average of the entire canvass being slightly above 10 hours for each day. The statistics show that approximately 50 per cent of the receipts of the electric lines in Michigan is paid for the labor they employ.

A partial canvass of the electric roads of the State made in 1895 showed the aggregate capital stock of all the companies was less than $8,000,000. There were operated at the time 400 miles of track. The annual receipts of all the companies were reported at $2,231,468, while their indebtedness approximated $11,000,000. At that time 1865 employees were canvassed, 75 per cent of the number conductors and motormen. Although this large per cent were of the better paid employees, the canvass showed that the average per diem received by all employees was only $1.69.

WESTINGHOUSE GETS IMPORTANT INTERURBAN CONTRACT

It is reported from Kalamazoo that the Westinghouse Electric & Manufacturing Company has been awarded the contract for equipping the Grand Rapids & Kalamazoo Valley Electric Railway. This road is to be sixty miles in length. The board of directors of the company is composed of W. H. Patterson and Frank Henry, of Kalamazoo; E. J. Anderson, of Plainwell; B. B. Kelsey and George Heffron, of Grand Rapids.

A WEEK OF VAUDEVILLE FOR BROOKLYN RAPID TRANSIT EMPLOYEES

The Brooklyn Rapid Transit Employees' Association is giving to its members and their friends at the East New York club house, an entertainment the like of which has never before been attempted in street railway association work. It is a vaudeville show for each evening during the week commencing Monday, March 27, with the special matinee on Saturday for the children of the members. Professional talent only has been engaged.

The main floor of the club house is so arranged that there are a lecture room with 500 permanent sittings, a gymnasium, and a game room, fitted with billiard, pool, card and checker tables. In designing the building the wise provision was made for temporary partitions to separate these rooms from each other. For such occasions as the present one the partitions are removed and temporary sittings placed on the gymnasium and game room floors, giving a total seating capacity of 1000. In addition to these is a permanent stage, also complete scenery and a drop curtain, all the property of the association. This makes possible the staging of almost any kind of a theatrical show.

Promptly at 8:15 each evening, the entertainment is begun. There are nine sketches, consuming in all 3 hours 15 minutes for their presentation. In them appear the best talent the metropolitan section has to offer. First there is an overture on the piano. Following this is a sketch entitled "All the Comforts of Home." "The Wonder" then does some truly wonderful things on a tight rope, and two colored artists appear in a musical sketch. Here the programme is varied by the telling of funny stories, several of which are puns on the company management. "Clancy's Second Job" follows. After this come two acrobats in a special feature. They are followed by "The Professor's Courtship," and "The Fellow Who Looks Like Me," both of which are well acted. The entertainment is closed by a series of moving pictures. On Saturday afternoon there is to be a special matinee for the children, at which it has been arranged to have a novel contest on the stage among young folks from the audience. To the winner will be awarded a valuable prize, the form of which is yet to be decided.

The expenses of this entertainment will all be defrayed from a special entertainment fund of the association, out of which were paid the school expenses. Like all of the attractions of the association, this one is without cost to the members. Each employee is entitled to two tickets, and as a special favor the company has arranged for free transportation to and from the club house by attaching to each ticket two coupons good for passage over the elevated or the surface lines.

Geo. F. Wolfram, trainmaster of the Brooklyn Bridge division, Henry Pistor, superintendent of the Bergen Street division, and Geo. W. Edwards, the secretary of the association, are the committee in charge of the entertainment.

MONTGOMERY SYSTEM SOLD—IMPROVEMENTS PLANNED

R. D. Apperson, of Lynchburg, Va., confirms the report that he and his associates have purchased the Montgomery Traction Company, of Montgomery, Ala. All the stock and bonds of the company have been taken over, and new officers have been elected as follows: R. D. Apperson, president; Charles R. Miller, secretary and treasurer. The deal really was consummated March 1, but announcement of its completion was not made until a few days ago. On Feb. 25 the company went into the hands of a receiver. On March 16 the receiver was discharged, and Mr. Apperson assumed formal control of the property. W. H. Ragland was appointed general manager, and C. C. Hogshead, superintendent. Important plans for betterments are already well laid. Five miles of additional double-track line have been contracted for. An order has been placed with the J. G. Brill Company for four 38-ft. convertible cars, each to be equipped with four GE 67 motors and air brakes. It is planned to build a car shed, repair and paint shop as soon as a suitable sight can be obtained. The present equipment of the road will be entirely overhauled. Park improvements also are contemplated. At Pickett Springs a skating rink and other attractions will be installed. Mr. Apperson, who negotiated the purchase, is president of the Lynchburg Traction & Light Company, Lynchburg Water Power Company, Roanoke Railway & Electric Company, Petersburg Gas Company, and the Columbia Gas Light Company.

THE AURORA, ELGIN & CHICAGO RAILWAY CELEBRATES

The officers of the Aurora, Elgin & Chicago Railway Company on March 17 celebrated the opening of train service from that road over the Metropolitan Elevated tracks into the heart of Chicago. The actual beginning of this service was on March 11. The officers of the company invited a number of newspaper men, electric railway men and others to take a trip over the company's line, leaving the downtown terminal of the Metropolitan Elevated on Fifth Avenue, near Jackson Boulevard at noon. The guests found a dining car ready to serve luncheon, and the meal began as soon as the train started. The guests sat down to what was probably the most elaborate meal ever served on an electric railway dining car. It was nothing of the buffet lunch order, but a substantial luncheon of seven or eight courses of the best the market affords. Had it been served in the evening at a downtown restaurant, followed by after dinner speaking, it would have been called a banquet. The train consisted of two cars—the dining car for the guests and one of the company's ordinary motor cars, which furnished the power and served the purpose of a kitchen and supply car. The dining car is arranged for use either as a parlor or dining car for special parties, and it is not unlikely now that the road has a downtown terminal some kind of a dining car service will be given, so that members of the golf clubs near Wheaton can leave Chicago at 12 or 1 o'clock and secure a buffet lunch on the way out. The special train went first to Aurora, then back to Eola Junction, then to Batavia, where the power house was visited, and then to Elgin. From Elgin back to Wheaton, a run of sixteen miles, was made in 17 minutes.

The object of the excursion was to celebrate the opening of through car service to the downtown district of Chicago. Formerly cars of this road stopped at Fifty-Second Avenue and transferred passengers to the elevated cars. The running of cars down town without change has resulted in an immediate and decided increase in the receipts, and means the making not only of this railway property, but of the suburban territory adjacent to it.

The officers of the road who were present in person to entertain the guests were: President L. J. Wolf, of Cleveland; General Manager Edwin C. Faber; Superintendent of Transportation Joseph O'Hara, and Auditor C. E. Flenner. The Metropolitan West Side Elevated Railway Company, which is the road over which the A. E. & C. Railway secured its terminal facilities, was represented by General Manager H. M. Brinckerhoff and Chief Engineer W. S. Menden. Colonel Bliss, attorney for the Chicago City Railway, and Theodore Stebbins, general manager for the receiver of the Appleyards roads in Ohio, were among the guests.

It was, of course, a proud day for the officers of the A. E. & C. Railway when they were able to take a party from the heart of Elgin to the heart of Chicago in less time than they could have been taken by the competing steam railroads, and surrounded by comforts equal to those found on the best limited trains of the steam railway trunk lines running between New York and Chicago. The special car on which this party was taken attained a speed of over sixty miles per hour as comfortably as any railroad train in the world.

J. G. WHITE & COMPANY'S SOUTH AMERICAN CONTRACTS

The London firm of J. G. White & Company, Ltd., has secured the contract for the conversion of one of the oldest mule roads in South America into an up-to-date electric traction system, viz., the Tramway Rural, which system was operated in and around Buenos-Aires, the principal city in the Argentine Republic, by Lacroze Brothers. The present road is about twenty-five miles long. It will be considerably extended. The White interests recently opened offices in Buenos-Aires. The orders will be placed through London, and those that come to this side will be handled through J. G. White & Company, of New York. The White interests have also secured an important contract for the building of another extensive electric traction system in South America, they having been awarded the contract for the construction and reconstruction of 82.7 km of single track in Montevideo, capital of Uruguay. The work includes permanent ways construction, overhead, underground and overhead feeder system; remodeling of stations for workshops and cars; erection of power house; building equipment of power station for generating 1950-kw, rolling stock, consisting of 70 convertible cars, 20 open cars, and one flat car and all accessory and contingent work which may be required to equip the whole system complete and ready for operation. The contract for the rails has already been allotted to the United States Steel Products Export Company, which handles the foreign business of the United States Steel Corporation. The cars will probably be purchased abroad.

The value of the entire Montevideo contract is about $1,825,000.

CONTRACT FOR BUILDING CHARLESTON & SUMMERVILLE RAILWAY

The Charleston & Summerville Railway Company, of which Ogden Edwards, of Troy, Ohio, is president, and Col. George Tupper, of Summerville, secretary and treasurer has entered into a contract with the Southern Electric Construction Company, of which Gen. Warner, of Gainesville, Ga., is president, and J. W. Davis, of Troy, Ohio, secretary and treasurer, to build an electric railway in Charleston, therefrom to Summerville and in Summerville, being about twenty-five miles in length. The power house is to be located at some point between Charleston and Summerville. The capacity of the plant will be 1500 kw. There will be six motor cars equipped with at least 200-hp motors. There will also be twelve trailers, two mail and express cars and two small modern freight and package cars.

APPLEYARD AFFAIRS

Another of the Appleyard properties in Ohio has been placed in a receiver's hands. It is the Urbana, Bellefontaine & Northern Railway, and the appointment was made as a result of a suit brought by bondholders, who stated that the interest due Feb. 1, 1905, had been defaulted. The receivers are J. G. Schmidlapp, of Cincinnati, and Myron H. Wilson, of Cleveland, who are acting as receivers for the other properties.

Suit in foreclosure of the mortgage given to secure an issue of $500,000 bonds on the Central Market Street Railway Company has been brought by the New York Trust Company, trustee for the bonds. The property is already in the hands of receivers.

All claim of Mr. Appleyard to an interest in the Ohio River & Western Railway, the steam road which he proposed to electrify, has been eliminated. The Hamby-Mooney syndicate, which owned the property, said that Mr. Appleyard never paid for his interest and they have been fighting for the property. Recently Mr. Appleyard transferred his claims to Charles K. Lawton, of Boston, who held the stock as collateral on a loan. Last week Mr. Lawton effected a compromise with the former owners and they now control the property without opposition. There is nothing now to indicate that the road will be electrified.

W. B. McKinley, of Champaign, Ill., head of the so-called McKinley syndicate, has issued a circular to the effect that the majority of holders of notes and unsecured indebtedness have requested the following committee to act in reorganizing the Dayton, Springfield & Urbana, and the Columbus, London & Springfield lines; Wm. B. McKinley, chairman; A. E. Lochen, of Boston, secretary; O. T. Martin, of Springfield, counsel. All notes and evidences of indebtedness are to be deposited with the Union Savings Bank & Trust Company, of Cincinnati, by April 1.

As outlined elsewhere in this issue, all the construction material used in the building of the Appleyard lines is to be sold by order of the court on April 4.

EQUIPMENT FOR THE TOLEDO, PORT CLINTON & LAKE SIDE RAILWAY

The Toledo Interurban Construction Company has awarded to the Allis-Chalmers Company the contract for the complete equipment of the new power house of the Toledo, Port Clinton & Lake Side Railway at Port Clinton, Ohio, including two 1280-hp Reynolds-Corliss engines, two 800-kw a. c. generators, two 50-kw d. c. generators, and one 400-kw a. c. rotary converter, all of Bullock type; two Tomlinson barometric condensers, and boilers, pumps, heaters, etc. The contract calls for the completion of the plant in every detail by or before July 1, and is noteworthy from the fact that of the very varied equipment to be furnished, the greater portion will be constructed in the manufactories of the successful bidders. Bullock railway motors have been in successful operation on this road for some time past.

Arrangements have been made to have the extension of the railway completed as far as Marblehead, and cars put in operation to that place from Toledo by the date specified. It is planned to run cars the entire length of the line—from Toledo to Lakeside—in two hours. Power for that portion of the road already in operation is being taken at present from a rotary converter used as a generator in the temporary power plant at Genoa, but the better facilities which will be afforded for distributing power equally over the entire system, and other conditions, make Port Clinton a more desirable point, and upon completion of the plant there the one at Genoa will be used only as a sub-station. Another sub-station is temporarily located below Oak Harbor.

NEW CAR HOUSE AND MACHINE SHOP IN NASHVILLE

Ford, Bacon & Davis, of New York, engineers for the Nashville Railway & Light Company, of Nashville, Tenn., inform the Street Railway Journal that it is proposed to build a new car house and machine shop in Nashville. The shop will be used only for repair work.

AN ADJUSTMENT BUREAU PROPOSED IN OHIO

Dr. H. B. Rockwell, of Cleveland, who formerly conducted a similar organization in New England, is forming in Ohio an association of the city and interurban railway companies to be known as the Railway Adjusting Bureau. He proposes that various roads pool their interests in the matter of accidents so that the resulting losses shall be divided among all the members of the association. The plan will cover claims for ejectments and other similar claims that might be brought against a road. It is also the intention to have an inspection bureau for the purpose of improving and standardizing roads which constitute the bureau. The contract provides that each road shall pay into the bureau annually an amount equal to 3½ per cent of its gross earnings for that period. All claims will be paid from this fund, and at the end of the year the amounts remaining after the expenses of the bureau have been paid will be returned to the companies in the form of dividends. Any company whose losses in a year shall exceed its assessment will not be entitled to share in dividends. In other words, the roads which have the largest claims receive the smallest profits. The fund in the treasury will not be reduced below $50,000. It is provided that not more than $40,000 shall be paid in settlement of claims from any single accident, and that not more than $7,500 shall be paid by the bureau in settlement of any one claim. The bureau will be managed by an executive committee selected by the companies, and a treasurer appointed by the committee shall be custodian of the funds.

The bureau will retain the services of expert adjusters, detectives, attorneys, physicians, and will take charge of all cases, relieving the company of all expense connected with an accident. The scheme is particularly advantageous for small roads that cannot afford the services of expert adjusters. It also relieves them of the possibility of a disastrous accident which might be so expensive as to result in their financial embarrassment. The inspection bureau would have a tendency to improve the standard of all roads interested. Dr. Rockwell has presented his plan to the managers in Ohio and outlined it before a recent meeting of the Ohio Interurban Railway Association. He has the endorsement of such men as Henry A. Everett, F. T. Pomeroy, Warren Bicknell, C. W. Wason and other prominent Cleveland managers, and has obtained contracts from six or seven roads in this district. However, the plan will not become operative until companies having gross receipts aggregating $2,000,000 shall have become identified with the bureau.

SALE OF CONSTRUCTION MATERIAL

C. A. Alderman, of Springfield Ohio, receiver for the Great Northern Construction Company, which built all the Appleyard properties in Ohio, is offering for sale all the construction equipment used in building these lines. The sale will be held six miles north of Urbana, Ohio, on the Urbana, Bellefontaine & Northern Railway, April 4, at 10 a. m. The property consists of two locomotives, a stationary engine and pump, a steam shovel, twenty center dump cars, five flat cars, two push cars, twelve small dump cars, shovels, picks, mauls and other material; also a railroad parlor car fitted with buffet and berths and upholstered in leather.

THE DETROIT TROLLEY SONG

In the Detroit "United Weekly" for March 22, is reproduced in its entirety "Come Along," the prize song of the Detroit United Railway Company. In addition to this the company has had printed for distribution copies of the song in standard music sheet size. These latter are in appropriate dress. There is a drawing in outline presumably of a supposititious scene along a trolley line, the crest of the hill being topped by cottages, while at the foot is the "babbling" brook. A reproduction in colors of a standard interurban car conveys the idea of what "Come Along" is all about. This is directly in the center of the page. In the lower left hand cover is a likeness of Paul Hoffichter, the composer of the song.

The piece is written in the key of C. As it is in three-quarter time, it is an excellent waltz, and would become distinctly popular for this reason alone. The setting on the whole is excellent. The chorus runs like this: "Come along, ding dong; hear the clanging gong. All aboard for a ride on the trolley. Let us sing aloud with the merry crowd; Come along, come along and be jolly. The rich and poor are on a par on the trolley," etc., etc.

THE ELECTRIFICATION OF THE ROME, WATERTOWN & OGDENSBURG

A. H. Smith, general manager of the New York Central & Hudson River Railroad, after a trip of inspection of the Rome, Watertown & Ogdensburg division on March 22, said in an interview at Syracuse that the company is planning to electrify the portion of the Rome, Watertown & Ogdensburg along the Black River from Carthage to Watertown, and thence to Sacketts Harbor on Lake Ontario. Mr. Smith was accompanied in his tour of inspection by A. T. Hardin, chief engineer of maintenance of way, and a previous inspection of the territory had been made by C. Loomis Allen, general manager of the Utica & Mohawk Valley Railroad.

Mr. Smith says that it is the purpose of the company to substitute electricity for steam as motive power at an early date on such portions of the system as are best adapted to it, leaving the general plan of electrification for short haul business for later development. It is understood that power for the electrified portions of the R. W. & O. in Jefferson County will be developed from Black River water power. Among the towns and cities to be served by the improved system will be Carthage, West Carthage, Black River, Watertown and Sacketts Harbor.

A COAL-FIELD POWER HOUSE PROJECTED

Indiana interurban men were greatly interested in a report during the past week that the erection of a mammoth power generating plant is projected in the heart of the Indiana coal field to furnish power to traction lines in Central and Southern Indiana at a rate much lower than the present one. The erection of such a plant was once before suggested, but this time the interurban men are encouraged because of the character of the Eastern men who are back of the project, and are only waiting the assurance that enough electric power can be sold to put the enterprise through.

The plan of the promoters is to buy a large tract of coal land in Green or Sullivan County and to erect the power house on this land. The coal mined would be directly at hand. The power house would be erected so that additional capacity could easily be had. The estimated cost of the plant, wires and poles is $1,000,000. It is known that Eastern capitalists have had two experts in Indiana for two weeks or more, and while they are reticent concerning details, traction men have indulged the presumption concerning the cause of their presence. The new company would also contract to furnish small cities and towns and many of the adjacent coal mines with electric power and light.

CHANGES AMONG BOSTON ELEVATED OFFICIALS

Paul Winsor has been appointed chief engineer of motive power and rolling stock, exercising general supervision over the mechanical and electrical engineering of the Boston Elevated Railway Company and the work of the department of motive power and machinery and the department of wires and conduits, reporting to the vice-president. John W. Corning, having charge of the electrical engineering and records of the department of wires, will hereafter report direct to the chief engineer of motive power and rolling stock. C. H. Hile has been appointed assistant to the vice-president, and James P. Boyden has been appointed acting superintendent of wires. John Lindall has been appointed assistant superintendent of motive power and machinery, and will give special attention to the care and maintenance of trucks, wiring, motors and the electrical apparatus of all cars, both surface and elevated. Clark W. Doty has been appointed acting general foreman of shops, elevated lines.

TEMPORARY RELIEF FOR BROOKLYN BRIDGE

The sum of $300,000 has been voted by the Aldermen of New York to provide for temporary relief in the handling of the crowds using the Manhattan terminal of the elevated lines operated from Brooklyn over the Brooklyn Bridge. Four new train platforms, three platform additions, and a full set of new stairways to serve them, besides more space on the mezzanine floor, are to be built. The two existing main platforms for elevated and bridge trains are to be extended 75 ft. eastwardly towards Brooklyn. These two extensions will go out beyond the present train shed in the form of inverted V's. Both will be covered. The existing terminal platform between the switching tracks is to be extended about 20 ft. easterly, and slightly widened. Hung on the north and south sides of the present shed will be long galleries, roofed over, and supported by brackets above the roadways. These two galleries will be 14 ft. wide, and will feed trains opposite the present loading platforms. New side platforms are to be built outside the present terminal switching tracks from a point opposite the end of the central platform, to the westerly end of the train shed. These platforms will be 25 ft. in width, and will overlap the easterly side platforms about 60 ft. They will also extend about 78 ft. outside the present train shed across Park Row. The total length of these platforms will be 275 ft. There will be nine new flights of stairs, two for each of the new side platforms, except on the southerly side of the present terminal tracks, where there will be three. Several of the existing stairways are to be widened.

CONTINUED HEARING ON THE BOSTON-PROVIDENCE PROJECTS

A continued hearing on the Boston & Providence situation was held at the State House in Boston, March 22, by the legislative committee on street railways. Howard C. Forbes, of Boston, a consulting engineer, opposed all the special bills seeking charters and the right to take private land by eminent domain. He stated that he represented interests desiring to form the Boston & Providence Interurban (Electric) Railroad under the general railroad law, and that his project is blocked while this legislation is pending. He claimed that the two underlying ideas of the seventeen measures before the committee are:

1. Operating cars at railroad speeds under a street railway law.

2. A high-speed railway running partly upon the highways and partly upon private land. He opposed the bills on the grounds that they are not in the interest of public safety; that they would not supply the kind of rapid transit which the people want; that they would tend to block the development of a better interurban service; that they are unnecessary legislation, and that certain of them are special legislation.

Mr. Forbes then discussed the subject of interurban railways at length, stating that they occupy a position midway between the street railways and the steam roads, combining the advantageous features of each and serving the public well through frequent cars, cheap fares, high speed and local stops en route. He emphasized the characteristics of the lines operating between cities in the Middle West, also handing the committee descriptions of the line between Seattle and Tacoma, and the Wilkesbarre & Hazleton road as printed in the STREET RAILWAY JOURNAL. He urged that the line to be built between Boston and Providence should not be permitted to be a combination street-and-private-right-of-way line, largely on the ground that the numerous highway crossings, curves and street running would be dangerous. The interurban road furnishes the people with a kind of transportation which they have not had before. An irresistible demand for this kind of service prevails throughout the country. Economically, it has already in the West become a great factor in the development of the country and in the production of wealth. It offers to the people greatly increased facilities for inter-communication. It causes people to travel more than they previously did, and thereby creates a large portion of its traffic. Every community that it touches is benefited, and in the end the competing steam roads gain more than they lose through competition. Mr. Forbes closed by saying that the steam roads have not furnished the so-called "interurban" service, although they have had at least ten years' opportunity to do so. They will not furnish such service, nor do they intend that anyone else shall. Such a policy is out of harmony with the public interest.

John Balch Blood, consulting engineer, of Boston, then urged the necessity of building a line that would stand for years as an example of the best high-speed practice in the field of interurban railway work. He prohibited the use of streets and strongly advocated the abolition of grade crossings. To his mind there are no insuperable engineering difficulties in the way.

The principal arguments in opposition from the steam railroads were presented by W. H. Coolidge, of the Boston & Maine, who took the ground that electric railroads should not be granted the privileges accorded steam roads without the corresponding responsibilities.

LARGE ORDER FOR BRAKES IN CHICAGO

The important announcement is made that the Chicago City Railway Company has adopted as its standard hand brake for all new rolling stock, the Peacock brake, made by the National Brake Company, Inc., of Buffalo, N. Y. The initial order alone calls for the equipment of 100 cars, requiring 200 brakes in all. That the Peacock brake is rapidly displacing the old-time hand brake on many railways, both large and small, is evidenced by contracts lately received from the Rhode Island Company, of Providence, the Connecticut Railway & Lighting Company, the Des Moines City Railway Company, the Brooklyn Rapid Transit Company, etc.

NEW YORK & PORT CHESTER COMPANY'S ACTION IN COURT AGAINST NEW YORK, WESTCHESTER & BOSTON COMPANY

The opposition being made by the representatives of the New York & Port Chester Railroad against the New York, Westchester & Boston Railroad, to prevent it from building its four-track electric line through the Bronx and Westchester County under the franchise secured from the New York Board of Aldermen, came before Attorney-General Mayer in Albany on Monday, March 27, on an application to begin a taxpayer's action to have the charter of the New York, Westchester & Boston Company declared invalid.

The petitioner is Anthony Stumpf, of Bronx Borough. In behalf of the application it was asserted that the charter of the company had lapsed in 1882, and that the special act of the legislature secured in 1903 did not rehabilitate it. It was also asserted that the company was never duly incorporated, as its certificate filed with the Secretary of State did not have attached, as required by law, the declaration that 10 per cent of its capital had been paid in.

Samuel Untermyer and Charles A. Collin appeared as attorneys for the petitioner, and Edward Lauterbach, William B. Hornblower, George S. Graham and J. T. Richards for the New York, Westchester & Boston. The latter attorneys impugned the motive of the petitioner and recited that he had attempted to hurt the credit of the company by certain publications.

It was argued that the New York, Westchester & Boston had secured in 1903 the passage of two laws by the legislature which made its charter valid. The banking firm of Dick & Robinson took up the question of the financing of the construction of the road and employed as counsel to advise them as to the validity of its charter, John G. Johnson and George S. Graham, leaders of the Philadelphia bar, and W. B. Hornblower and Charles E. Hughes. These attorneys reported favorably on the charter.

Attorney-General Mayer took the papers and reserved his decision.

OFFER FOR SPRINGFIELD STOCK.

Lee, Higginson & Company, of Boston, are offering $225 per share for a majority or all of the stock of the Springfield Street Railway Company, of Springfield, Mass. Stockholders have the option of taking all cash or $75 in cash and $140 in 4 per cent cumulative preferred stock of a holding company, to be called the Springfield Railways Company.

INDESTRUCTIBLE FIBRE FOR HEADLININGS

The Indestructible Fibre Company has just completed a large plant at Massena, N. Y., which is equipped with modern machinery throughout for the manufacture of a composition known as indestructible fibre. This material is manufactured of wood fibre hydraulically preserved so as to make a compact and durable board, which can be supplied in any shape or width and which takes a high polish. It is being put on the market for car headlinings for both steam and street railway use. The sales end of this department will be in charge of Edward H. Chapin, of 35 Nassau Street, New York, who will conduct it as a side line to his other duties.

NEW YORK CENTRAL AND TROLLEY SCHEDULES TO JIBE

The New York Central Railroad's passenger department is arranging for closer connection between its fast trains and the cars of the electric railroads in Central New York, the contral of which it recently acquired. In carrying out this idea George H. Daniels, general passenger agent, and other passenger men last week made a tour of inspection of the trolley lines in the territory mentioned. The trip ended at Syracuse on March 24, when the Syracuse Rapid Transit system was studied. The day before the party inspected the Utica & Mohawk Valley and the Schenectady railways.

At Syracuse Mr. Daniels said to the representative of the Street Railway Journal in that city: "We are simply putting into practice what we have planned from the first. We intend to make the electric lines feeders to our system, and to do this more effectively we plan to establish co-operative time-tables, as it were, thus making the connection between the two branches of our service very close."

It is the intention to place on sale, soon, tickets which will be good partly on fast trains and partly on the suburban electric lines out of Utica and Syracuse.

LARGE CAR ORDER PLACED FOR CHICAGO

The St. Louis Car Company, of St. Louis, Mo., has been awarded the contract for the sixty new cars for the Chicago Union Traction Company, of Chicago, Ill. The award was made at the meeting of the receivers of the railway company on Thursday, March 23. The equipment contract was given to the General Electric Company. The amount involved is upwards of $300,000.

PERSONAL MENTION

MR. PETER C. NICKEL has been appointed claim agent of the New York City Railway Company, vice Mr. William A. Dibbs, resigned.

MR. HENRY PHIPPS has been elected a director of the Philadelphia Rapid Transit Company, of Philadelphia, Pa., to succeed Mr. Michael Murphy, resigned.

MR. WILLIAM WHITE, claim agent of the Chicago City Railway, is dead. Mr. White was a member of the executive committee of the American Association of Street Railway Claim Agents.

MR. A. D. McWHORTER, who for five years has been general foreman for the Georgia Railway & Electric Company, of Atlanta, Ga., has been made master mechanic of the Memphis Street Railway Company, of Memphis, Tenn.

MR. HENRY E. HUNTINGTON, president of the Huntington syndicate of urban and interurban railroads out of Los Angeles, who has spent the winter in New York, will arrive in Los Angeles about April 1. The commencement of many important improvements await his coming.

MR. I. L. MELOON has resigned as general manager of the Atlantic Shore Line Railway, of Kennebunkport, Me., and accepted a position with the National Light, Heat & Power Company, of New York. Mr. George A. Murch has been oppointed to succeed Mr. Meloon at Kennebunkport.

MR. HUGH HAZELTON, whose resignation as electrical engineer of the Manhattan division of the Interborough Rapid Transit Company was mentioned last week, severed his connection with that company to become associated with Mr. L. B. Stillwell in his consulting engineering practice. Mr. Hazelton has been prominently connected in an engineering capacity with the rapid transit development of New York, including the Manhattan Elevated and Interborough Rapid Transit Subway, and the announcement that he will still be associated with Mr. Stillwell is assurance that he will take an active part in the equally important work upon which the latter is engaged, such as the equipment of the Hudson Companies and other enterprises.

MR. W. H. SMITH, of Pasadena, Cal., has been appointed general manager of the Vallejo, Benicia & Napa Valley Electric Railway, now practically completed between Vallejo and Napa, Cal. The road is being equipped with the Westinghouse single-phase system, and is expected soon to be ready for operation.

MR. H. E. REED, former superintendent of the Trenton & New Brunswick Railroad, has been appointed superintendent of the Camden & Trenton Railway, and Mr. Howard Fravel has been appointed to succeed Mr. Reed with the Trenton & New Brunswick Railroad. Mr. Fravel comes from Dayton, Ohio, where he was superintendent of the Dayton & Western Traction Company's road.

GENERAL WM. A. BANCROFT, president of the Boston Elevated Railway Company, was the speaker of the evening at the New England Street Railway Club's meeting on March 23, at the Revere House, Boston. His subject was "Local Transportation in America and Europe," with conclusions based upon personal observations in this country and abroad. A large number of lantern slides were shown.

MR. FRANK. S. RANDLETT, master mechanic of the Old Colony Street Railway Company, is dead. Prior to the organization of the company, Mr. Randlett was master mechanic at the Taunton car house. His duties were afterward extended to include Brockton and other places. Three years ago he was made master mechanic in charge of all the lines south of Boston. Mr. Randlett was only 31 years of age.

MR. FREDERICK A. HUNTRESS, general manager for the Worcester Consolidated Street Railway Company, has resigned that office to accept the position of general manager of the Rio Janeiro Light & Power Company, of Rio Janeiro, Brazil. This is a new $25,000,000 corporation which has just organized by New York and Canadian capitalists who are largely the same as those interested in the Sao Paulo Railway & Lighting Company.

MR. H. A. TIEMANN, who has been in the motive power department of the Interborough Rapid Transit Company of New York for the past year, has become associated with the engineering staff of the Memphis Street Railway Company, of Memphis, Tenn. Mr. Tiemann left for Memphis on March 24 to take up his new duties. For four years previous to going to New York he was electrical engineer of the Schenectady Railway Company, of Schenectady, N. Y.

MR. M. J. FRENCH, roadmaster of the Syracuse Rapid Transit Railway Company, of Syracuse, N. Y., has resigned to return to the engineering force of the Utica & Mohawk Valley Railroad at Utica, where he was located previous to his going to Syracuse a year ago. The new roadmaster of the Syracuse Rapid Transit is Mr. Burt Wilbur, who has been connected with the company as superintendent of overhead construction. He will superintend both the track and overhead work hereafter.

MR. E. A. TURPIN, chief clerk in the general manager's office of the Union Traction Company, of Indiana, at Anderson, and acting superintendent of the freight and express department of that company, has resigned to become connected with the Chicago & Milwaukee Electric Railway, of which Mr. A. L. Drum, formerly general manager of the Union Traction Company, is the general manager. Mr. Turpin has been succeeded in the freight department of the Indiana Company by Mr. M. E. Graston, recently local agent of the Big Four at Wabash.

MR. P. E. FANSLER has been appointed private secretary to Mr. J. G. White, president J. G. White & Company. Mr. Fansler graduated from Purdue University in 1901 with degree of B. S., and took up post graduate work, receiving the E. E. degree in 1903. During this work he had general charge of the extensive efficiency test made in the spring of 1902 on the Union Traction system of Indiana, the results of which he presented in a joint paper with Prof. W. E. Goldsborough at the Niagara Falls meeting of the American Institute of Electrical Engineers. Mr. Fansler was appointed chief clerk, department of electricity, at the St. Louis Exposition in June, 1902, and in this position had charge of many of the details in connection with the department's work before, during and after the exposition. He resigned from the exposition staff last month to become associated with J. G. White & Company. Mr. Fansler is an associate member of the American Institute of Electrical Engineers, and has been a frequent contributor to French, English and American technical journals.

TABLE OF OPERATING STATISTICS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. * Including taxes. † Deficit. ‡ Includes value of bridge destroyed by flood, $4,189.

Company	Period	Total Gross Earnings	Operating Expenses	Net Earnings	Deductions From Income	Net Income, Amount Available for Dividends
AKRON, O. Northern Ohio Tr. & Light Co	1 m. Feb. '05	60,312	35,462	24,850	22,917	1,934
	1 " " '04	56,884	34,154	22,729	22,667	63
	2 " " '04	125,777	72,354	53,223	45,834	7,390
	2 " " '04	116,491	71,252	45,238	45,134	106
AURORA, ILL. Elgin, Aurora & Southern Tr. Co	1 m., Jan. '05	33,906	22,297	11,609	9,333	2,276
	1 " " '04	34,694	22,309	12,385	9,256	3 129
	7 " " '05	273,996	153,064	120,932	65,173	55,760
	7 " " '04	276,955	162,339	114,616	64,374	50,242
BINGHAMTON, N. Y. Binghamton Ry. Co	1 m., Feb. '05	17,134	10,696	6,438	------	------
	1 " " '04	15,864	10,982	4,882	------	------
	8 " " '05	173,001	91,905	81,096	------	------
	8 " " '04	160,816	85,985	74,830	------	------
BUFFALO, N. Y. International Tr. Co	1 m., Feb. '05	290,939	192,226	98,713	126,201	†27,488
	1 " " '04	284,349	199,660	84,689	126,492	†41,803
	8 " " '05	2,840,638	1,542,899	1,297,738	1,096,245	201,494
	8 " " '04	2,679,183	1,568,271	1,210,912	1,060,040	150,871
CHICAGO, ILL. Aurora, Elgin & Chicago Ry. Co	1 m., Jan. '05	26,259	19,831	6,428	------	------
	1 " " '04	22,136	------	------	------	------
	7 " " '05	293,799	156,326	137,473	------	-----
Chicago & Milwaukee Elec. R. R. Co	1 m., Feb. '05	23,599	14,888	8,710	------	------
	1 " " '04	18,047	10,585	7,463	------	------
	2 " " '05	48,425	29,542	18,883	------	------
	2 " " '04	37,034	21,397	15,638	------	------
CLEVELAND, O. Cleveland, Painesville & Eastern, R. R. Co	1 m., Feb. '05	11,209	8,971	2,238	------	------
	1 " " '04	11,685	9,908	2,777	------	------
	2 " " '05	24,555	18,708	5,847	------	------
	2 " " '04	23,425	17,932	5,493	------	------
Cleveland & Southwestern Traction Co	1 m., Feb. '05	30,406	22,923	7,483	------	------
	1 " " '04	27,456	22 499	4,957	------	------
	2 " " '05	65,166	45,700	19,466	------	------
	2 " " '04	55,307	45,056	10,251	------	------
DETROIT, MICH. Detroit United Ry	1 m., Feb. '05	321,177	*211,070	110,107	92,970	17,137
	1 " " '04	288,346	*205,928	82,418	89,787	†7,369
	2 " " '05	677,373	*440,275	237,098	186,407	50,691
	2 " " '04	599,786	*432,031	167,755	177,354	†9,599
DULUTH, MINN. Duluth St. Ry. Co	1 m., Feb. '05	43,451	25,335	18,116	16,711	1,405
	1 " " '04	41,883	27,754	14,129	16,445	†2,316
	2 " " '05	91,044	53,243	37,801	33,440	4,361
	2 " " '04	87,426	56,548	30,878	32,820	†1,942
FORT WORTH, TEX. Northern Texas Traction Co	1 m., Feb. '05	36,423	24,571	11,852	9,482	2,371
	1 " " '04	35,333	22,807	12,527	9,333	3,193
	2 " " '05	80,532	50,795	29,737	19,705	10,032
	2 " " '04	72,964	48,275	24,688	18,667	6,021
HAMILTON, OHIO. Cincinnati, Dayton & Toledo Trac. Co	1 m., Jan. '05	33,498	22,460	11,038	‡20,651	†9,613
	1 " 04	31,041	22,509	8,533	16,287	†7,755
	8 " " '05	354,811	201,060	153,751	135,595	18 156
	8 " " '04	359,003	295,893	163,110	128,799	34,311
HANCOCK, MICH. Houghton County St. Ry. Co	1 m., Jan. '05	15,674	14,854	820	3,407	†2,587
	1 " " '04	14,429	12,921	1,508	3,080	†1,572
LONDON, ONT. London St. Ry. Co	1 m., Jan. '05	13 384	10,789	2,594	2,123	471
	" " '04	11,409	10,259	1,150	2,061	†911
	12 m., Dec. '04	180,018	122,674	57,344	29,156	28,188
	12 " " '03	172,085	109,493	62,591	26,989	35,603
MILWAUKEE, WIS. Milwaukee El. Ry. & Lt. Co	1 m., Feb. '05	236,025	128,378	107,647	71,193	36,455
	1 " " '04	240 725	135,565	105,160	71,735	33,425
	2 " " '05	492,483	258,606	233,877	145,543	88,334
	2 " " '04	500,138	275,117	225,021	146,453	78,568
Milwaukee Lt., Ht. & Tr. Co	1 m., Feb. '05	33,856	19,287	14,568	18,373	†3,804
	1 " " '04	27,673	17,385	10,288	15,273	†4,985
	2 " " '05	72,379	39,069	33,310	37,316	†4,005
	2 " " '04	57,755	35,204	22,550	29,494	†6,943
MINNEAPOLIS, MINN Twin City R. T. Co	1 m., Jan. '05	351,121	175,314	175,806	97,325	78,481
	1 " " '04	331,412	169,002	162,411	87,519	74,891
MONTREAL, QUE. Montreal St. Ry. Co	1 m., Feb. '05	185,864	147,896	37 968	20,478	17,491
	1 " " '04	168,685	131,421	37,265	16,940	20,325
	5 " " '05	1,027,214	701,878	325,336	95,805	229,530
	5 " " '04	937,822	618,258	319,564	85,788	233,775
MUNCIE, IND. Muncie, Hartford & Ft. Wayne Ry. Co	1 " Feb. '05	11,226	*6 460	4,766	4,167	599
	1 " " '04	11,278	*7,456	3,822	------	------
	2 " " '05	24,003	*12,979	11,024	8,333	2,690
	2 " " '04	22,847	*13,842	9,005	8,000	1,005
OAKLAND, CAL. Oakland Traction Consolidated	1 m., Jan. '05	104,673	61,521	43,152	30,485	12,667
	1 " " '04	94,511	52,309	42,202	26,567	15,635
	1 " Feb. '05	100,354	56,576	43,778	30,818	12,960
	1 " " '04	85,546	49,618	35,929	26,567	9,362
	2 " " '05	205,027	118 097	86,930	61,303	25,627
	2 " " '04	180,057	101,927	78,131	53,134	24,997
San Francisco, Oakland & San Jose Ry. Co	1 m., Feb. '05	41,170	15,429	25,741	13,009	12,732
	1 " " '04	28,069	13,278	14,791	7,398	7,393
OLEAN, N. Y. Olean St. Ry	1 m., Jan. '05	8,788	3,890	4,898	2,693	2,205
	1 " " '04	7,225	4,019	3,206	2,452	754
	7 " " '05	69,166	33,509	35,657	18,513	17,144
	7 " " '04	62,265	28,947	33,317	17,165	16,153
PEEKSKILL, N. Y. Peekskill Lighting & R. R. Co	1 m., Jan. '95	9,116	*5,987	3,129	------	------
	1 " " '04	8,643	*5,735	2,908	------	------
	7 " " '05	71,803	*40,188	31,616	------	------
	7 " " '04	69,302	*39,213	30,089	------	------
	1 m., Feb. '05	7,766	*5,323	2,444	------	------
	1 " " '04	7,755	*5,664	2,091	-----	------
	8 " " '05	79,570	*45,510	34,059	------	------
	8 " " '04	77,056	*44,877	32,180	------	------
PHILADELPHIA, PA. American Rys. Co	1 m., Feb. '05	97,925	------	------	------	------
	1 " " '04	93,131	-----	------	------	------
	8 " " '05	982,195	------	------	------	------
	8 " " '04	944,517	------	------	------	------
ROCHESTER, N. Y. Rochester Ry. Co	1 m., Feb. '05	124,452	74,442	50,010	26,777	23,233
	1 " " '04	109,751	68,809	40,942	26,220	14,722
	2 " " '05	259,403	152,033	107,370	53,763	53,607
	2 " " '04	223,205	139,674	83,531	52,345	31,186
SAN FRANCISCO, CAL. United Railroads of San Francisco	1 m., Feb. '05	516,967	------	------	------	------
	1 " " '04	482,403	------	------	------	------
	2 " " '05	1,060,338	------	------	------	------
	2 " " '04	1,009,313	------	------	------	------
SAVANNAH, GA. Savannah Electric Co.	1 m., Jan. '05	41,340	25,607	15,733	10,553	5,180
	1 " " '04	39,734	24,947	14,787	10,563	4,224
SEATTLE, WASH. Seattle Electric Co	1 m., Jan. '05	201,760	142,636	59,124	25,135	33,989
	1 " " '04	189,813	137,880	51,933	23,187	28,746
SYRACUSE, N. Y. Syracuse R. T. Co	1 m., Jan. '05	74,205	44,251	29,954	20,334	9,620
	1 " " '04	67,460	42,830	24,630	20,296	4,334
	7 " " '05	514,816	292,708	222,108	142,059	80,049
	7 " " '04	492,105	281,987	210,118	142,002	68,117
TERRE HAUTE, IND. Terre Haute Tr. & Lt. Co	1 m., Jan. '05	46,247	30,187	16,060	8,962	7,098
	1 " " '04	41,188	29,867	11,321	9,529	1,792
TOLEDO, O. Toledo Rys. & Lt. Co.	1 m., Feb. '05	133,405	*69,231	64,174	42,819	21,355
	1 " " '04	124,037	*71,951	52,086	41,589	10,497
	2 " " '05	284,349	*145,321	139.028	85,520	53,508
	2 " " '04	261,555	*145,908	115,647	82,902	32,745
YOUNGSTOWN, O. Youngstown-Sharon Ry. & Lt. Co	1 m., Jan. '95	41,056	24,820	16,236	------	------
	1 " " '04	36,947	------	------	------	------

Street Railway Journal

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Of this issue of the Street Railway Journal 8300 copies are printed. Total circulation for 1905, to date, 115,550 copies—an average of 8253 copies per week.

The Election in Chicago

The street railway situation in Chicago is considerably cleared as a result of the city election on April 4. Judge Dunne, the successful candidate, stands committed to "immediate municipal ownership" of the street railways, whatever that may mean. We consider the policy which has just triumphed at the polls in Chicago not only unwise from every standpoint, but in the case of that city absolutely impracticable. For this reason the hollowness of the municipal ownership proposition will develop much sooner with a Mayor who proposes an immediate consummation of the plan rather than one who advocated a gradual absorption of the city's transportation facilities, as did Mr. Harlan, the Republican candidate.

Gasoline-Electric Motor Cars

At least five different companies or individuals in the United States, as well as a larger number abroad, are at the present time experimenting or preparing to experiment with independent motor cars of the gasoline-electric type as a substitute for regular electric traction on interurban lines with sparse population. The combination is an old and familiar one, namely, a gasoline engine driving a dynamo; a dynamo charging a storage battery; the storage battery and dynamo together supplying current to electric motors of the ordinary railway type mounted on the trucks. The few trials that have been made in previous years with this type of apparatus in the United States have been uniformly unsuccessful, but it must be admitted that most of them were made with extremely crude apparatus. One might almost say they were assembled from a junk heap. The present experiments will be much more thorough. The fact that most of them are being undertaken by persons and companies of business and engineering ability will make the system a success if it is possible to do so. On the whole, we are inclined to agree with the views of Philip Dawson expressed in his comprehensive article on independent motor cars in Europe, published in our issue of Nov. 5, 1904. Mr. Dawson's conclusions favored very strongly the plain gasoline motor car with mechanical transmission from the engine to the car axle rather than the complicated, costly and bulky gasoline-electric motor car, where the transmission from the engine to the car axle is through the medium of dynamo storage battery and electric motor. The principal reason for adding electrical apparatus to the plain gasoline motor car is to secure a greater momentary capacity of the motive power during acceleration and for ascending grades. It is argued by those who favor this system that to carry a gasoline engine large enough to give rapid acceleration of a large steam passenger coach would involve great difficulties. We are not in the least inclined to dispute this point, but it appears to us that it is a mistake to assume that rapid acceleration is needed in the kind of service that gasoline motor cars are best fitted. If the situation is such that rapid acceleration is required, it is to figure on ordinary electric traction rather than on independently driven motor cars at infrequent intervals. It is difficult indeed, both for steam and electric railway men, to break away from established precedents. Because steam locomotives can haul freight trains, the steam railroad man who is considering gasoline passenger cars for branch lines, demands that these cars be capable of hauling a small freight train at full speed. The electric railway man who is used to rapid acceleration and heavy cars operated at high speeds on interurban roads, considers that any successful gasoline motor car must perform the same service with the same weight of car. We are inclined to contest the truth of either the steam or street railway men's assumptions. What is wanted on branch steam lines is something which can make a number of trips a day to accommodate passenger and light freight traffic. If a lot of heavy freight must be hauled at one time it is a simple matter to get a steam locomotive off the main line to do the job. There is no sense in demanding a car that must fill such extremely variable conditions. It is akin to demanding a tool that is suited both to clock repair and truck repair. On the other hand, if an interurban line is to be built through a country which will not justify the investment and operating expenses involved by an ordinary interurban road, it is perfectly safe to assume that there is not going to be any crying demand on the part of the population for rapid acceleration and very fast schedules. They will be satisfied with a very modest service, and that is all that the company can afford to give them. What then is the use in assuming that the weight and speed of rolling stock common on first-class interurban roads must be maintained on a small road operated with gasoline motor cars? To be sure, if a gasoline motor car must carry, in addition to gasoline, a dynamo, a storage battery and a set of motors on the trucks, the weight is likely to run up so as to equal or exceed the heaviest interurban electric cars and to rival a light steam locomotive. But why all this weight? If a road is going to haul freight on a scale such as to demand a formidable machine of this kind, why not use a steam locomotive, which can probably be operated and maintained as cheaply as a gasoline-electric combination where the gasoline-electric car assumes such formidable proportions as some of those now proposed? We do not wish to throw cold water on experiments of this kind, and those who are backing them deserve a great deal of credit for their attempts to solve this problem; but is it not well to look carefully at the requirements of the service before building the machine?

Steam Road Competition in Illinois

It is being heralded through the daily press that the Chicago & Alton Railway, in Illinois, is ordering a lot of light locomotives with which to maintain a local passenger service between the numerous towns along its line which are connected or about to be connected by electric interurban lines. We do not know whether this is merely a game of bluff or whether the company expects to compete successfully with a parallel electric line by means of steam trains. In either case the situation is amusing. The statement has been made so often by steam railroad companies that they proposed to electrically equip certain portions of their line which were about to be paralleled with electric roads that one would think the novelty had sufficiently worn off. To be sure, almost any steam railroad in the Middle Western States, should it decide to lay an additional track and operate electric cars over it, could give any competing electric road most disastrous competition. The wonder is that these steam railroad companies did not wake up to the situation before they were paralleled by electric roads through all their best territory. There was a time when, had they seen fit to utilize their present right of way, they could have kept the independent electric road out of the field as far as any parallel lines are concerned, and they would have been enjoying the present business of electric interurban railways with much lower fixed charges and, in some respects, better terminal facilities. The fact is, however, that steam railroad companies have so far carefully refrained from doing anything more than bluffing as to the equipment of their lines for electric interurban service, and the building of independent interurban lines has gone merrily on. To be sure, the steam railroad man may say he has all he wants to do hauling heavy freight and through passenger trains, but he might have retained the local freight and passenger business as well had he gone about it in the right way in the first place.

Uniform Rates

One of the questions brought up in the discussion at the March meeting of the Indiana Electric Railway Association brings one to realize more forcibly than ever how rapidly the interurban electric railway business is getting away from a business of a purely local character. It was strongly urged by at least two speakers that interurban railways must come nearer and nearer to uniformity in rates and methods of doing business with the public. So long as an electric railway was a purely local enterprise it made little difference what rate any company might charge for special cars or what the rate per mile might be for regular passenger fares. As one interurban line connects with another, and as networks of interurban lines gradually form, the public mind begins to compare the rates and methods of doing business of one road with those of another, and always to the detriment of the road having the highest fare or having methods of business which cause the most inconvenience to the traveler. The public always wants the most it can get for its money. If one road has a rate of 1¼ cents per mile and another road in the same locality a rate of 2¼ cents per mile, there is sure to be a steadily increasing amount of objection to the higher rate. The public argues that if one road can afford to haul passengers for 1¼ cents per mile another road can do so. This may or may not be true, but as regards rates of fare there is a constant pressure brought to bear by the public and by various local authorities to reduce the rate of fare to the lowest in vogue anywhere in that part of the State. Where a passenger has occasion to make trips covering more than one line of interurban road, and where the rates of fare vary greatly, his attention is naturally attracted to the differences. To be sure, at the present time few passengers think of interurban fares on a mileage basis, because they are not usually made up exactly on a mileage basis, but the tendency is that way, and is more likely to increase rather than decrease. With constant pressure being brought to bear on interurban railway companies to have the fares on all roads as low as the lowest, there is only one thing for the companies to do, and that is to get together and agree on a fair rate, and for all companies charging less than this amount, to raise their rates. In some cases the franchises will stand in the way of this, but the more modern roads having their own rights of way are not usually limited as to rates of fare. If all of the companies that can do so keep their rates up on a fair paying basis, it will to a large extent stop the tendency to hammer rates of fare below such a basis. In doing this interurban companies will simply be following the practice which steam railroads found it necessary to adopt.

As regards methods of doing business, which includes such a variety of things that they can hardly be enumerated here, the tendency of the public is to force the companies to give accommodations equal to the best. For example, the free checking of baggage on one road is likely to cause great pressure to be brought to bear on other roads to do the same thing. The policy for interurban companies to follow in this case is to get together and agree on a uniform practice about many matters of this kind before the public begins to criticise adversely these discrepancies. Where an interurban road is isolated without connections with any other road, there is little need for uniformity of practice, but as soon as connections spring up, the need of uniformity begins to assert itself at once. In line with this is the importance of making it easy for passengers to transfer from one line to another at junction points and arranging time-tables so that cars connect. As regards actual uniformity of rolling stock, there is not as much necessity now as there will be in the future, when the operation of cars of one company over the tracks of another company becomes more common. The time is sure to come, however, when it must be possible to operate the rolling stock of one road over another road because of the traffic arrangements and consolidations that will take place. At the present time the chief mechanical obstacle in the way of this in most cases is the limited clearances on some roads and the small flange ways in tracks in some cities. The necessity for coupling together interurban passenger cars of different companies and operating them in trains is considerably more remote, and will probably involve the equipment of all motor cars with an interchangeable system of multiple-unit control. This, however, is too far in the future to be worth considering just at present. The main thing is for interurban companies now having connections to get together and standardize some of the details where standardizing would be of most practical benefit.

The Express and Freight Business

Our Question Box has contained of late a good many references to freight and express matter carriage by electric railway companies, and there seems to be wide difference of opinion on the topic. Granting that an electric road is, as a rule, primarily designed for passenger business, is there any sufficient reason why it should not carry goods in large or small quantities if it has been granted the right so to do? The express business and the freight business are somewhat different in their requirements, so that one might pay where the other would not. In certain places the freight traffic pays handsomely, and we have over and over again urged the importance of obtaining the right to haul freight whenever possible. The track and roadbed of the electric line should for this work be able to handle standard freight cars, as is the case on most interurban lines, and motor cars of power adequate to haul a short freight train, say two or three cars, are desirable, while if the business really amounts to much a light locomotive or two will be required. Local conditions should easily determine whether the amount of freight readily obtainable is sufficient to justify some special preparations for it, but from the general experience there seems to be a rather widely diffused sentiment to the effect that, as a rule, freight haulage cannot be done to good advantage; we are disposed to think that there are nearly as many exceptions as cases, according to rule. Heavy grades, which are assiduously avoided by steam roads and are frequently taken by electric roads, are the main physical difficulty in the case. But fairly level interurban roads running through a well-settled country certainly have a good chance to make freight carrying profitable.

The express business is on a very different basis. As it exists on our electric roads, it takes three forms, representing perhaps three stages of evolution. The first is merely the carriage of parcels for a small fee, merely as an accommodation, without any special equipment or extra help. This is only possible within narrow limits and on a small scale, and we have no doubt that it adds enough to the revenue and to the popularity of the road to make it worth the while. The next stage is the carriage of parcels systematically between termini or definite stations in cars used partly or wholly for the purpose. On the longer interurban lines, where combination express, baggage and mail cars are in use, the added expense of handling goods in moderate amounts is trivial and can generally be counted as leaving a good profit for work on a moderate scale. In fact, a road finds itself rather under moral obligations to do this sort of thing for the convenience of its patrons. The third stage is the evolution of a regular express organization with facilities for delivering and collecting goods, and special provisions of rolling stock for their carriage. This is quite another proposition, for it means going squarely after the express business of the community as a competitor of others. Here again the local situation is closely involved. There are many communities in which the express business is now very badly conducted in point of promptitude. Suburban cities and towns are especial sufferers from lack of prompt service. Either express matter reaches the town via a steam road with none too good service, and is delivered when and how the local agent, who is usually the station master, sees fit, or it comes via team at about 2 miles per hour once or twice per day. It is a common experience for dwellers in suburban towns to have things delivered on Monday morning instead of Saturday night, more especially if the goods chance to be perishable.

Now an express service via an electric line which has quick and frequent service can help matters amazingly in such cases. A single express car can keep goods moving as fast as they can be taken care of at the termini, and the very fact that the express matter does not all strike town at once makes better deliveries possible. The real success of an express business lies in its promptness, and in this particular an electric system certainly has the call over all competitors. Where it has been tried on a fair scale it has very generally prospered. The one thing needful is that the population served be enough to supply a sufficient volume of business.

There is, of course, a possibility of sub-letting the express privilege to some existing express concern, but we rather doubt whether this is often a wise policy, since the old concern is apt to bring its old and inefficient methods with it, and very few communities would tolerate without protest the use of public streets by express cars merely to perpetuate old evils. If the situation is sufficient to warrant trying express service at all, it can usually be done best directly by the railway itself, whether in its own person or by a side organization, which is practically another pocket in the same coat. In other words, if there is business enough in the community to warrant an organized express business, the electric road had better take the profits than divide them with somebody else. There may be, of course, local causes for dodging the issue, but the promptness to be secured by electric service is so considerable an advantage that it should be turned into profit, unless there is some very good special reason to the contrary. In no case does express business call for the heavy extra equipment of freight traffic. In the minimum it demands space for a few parcels on the platform, and as a maximum one or two light express cars. We are inclined to think that in the average case the express business would be well worth while up to the point where a local delivery organization becomes necessary, and more often than is generally supposed, such an organization would be a source of profit. But, as one contributor to the Question Box recently intimated, it is well to fight shy of any course that would seem to curtail the rights of passengers to carry reasonable personal packages.

OVERHEAD CONSTRUCTION FOR SINGLE-PHASE LINES IN EUROPE

In the last issue of this paper a report was published of the discussion on overhead construction for single-phase railways at the March 24 meeting of the American Institute of Electrical Engineers. A feature of this meeting was an extended description by C. O. Mailloux, of New York, of the overhead line used on the Spindlersfeld and Seebach-Wettingen lines, both of which were visited by him during a recent trip to Europe. Mr. Mailloux accompanied his remarks by a series of stereopticon views, some of which are reproduced herewith. The latter portion of the accompanying article was contributed by Mr. Mailloux after the adjournment of the meeting.

After stating that one of the most important questions in the application of electricity to heavy electric traction was that of conveying the electrical energy, in large amounts, safely, conveniently and successfully from the stationary line to the locomotive, Mr. Mailloux paid a tribute to the great courtesy of foreign railway engineers in placing facilities at his disposal for investigating their lines, particularly the Oerlikon Company, the A. E. G. of Berlin, and Ganz & Company.

Before leaving this country, the speaker said that he was somewhat skeptical in regard to the feasibility of raising above 3000 volts the potential difference which may be applied direct to the motors, even though he knew that 3000 volts had been used successfully in this manner for a year or more on the Valtelina line in Northern Italy. He was pleased to say that his doubts on this point were soon dissipated by what he saw, especially on the Spindlersfeld line, near Berlin, and on the experimental line, which has since become a working line, built in Switzerland by the Oerlikon Company, near Zürich. He returned a firm believer in, and a strong partisan of, high potential contact lines. The words "contact line" are here used, he explained, in a sense which would include trolley lines or even third-rail conductors, both of which are terms of restricted meaning, destined, in his opinion, to disappear.

He indorsed strongly Mr. Damon's view in favor of higher contact line potentials for alternating-current railway motor cars; and as between 3300 volts and 6000 volts, he was inclined to favor 6000 volts as the standard which should be adopted for interurban lines. He disagreed with Mr. Damon, however, in regard to the form of line construction. This point will be again referred to later.

He also agreed fully with Mr. Damon that, for steam railroad conditions, a line contact pressure of at least 15,000 volts is desirable. One of the important results of his European trip of investigation was the evidence which he was able to obtain, as the result of personally-conducted tests and experiments, of the feasibility of contact line potentials of at least 15,000 volts.

The contact line having catenary suspension, which was a novelty at the time of his trip to Europe, has recently been introduced here, and has already, judging from the data contained in Mr. Damon's paper, reached a high stage of development. The catenary contact line, used on the Spindlersfeld line with 6000 volts potential difference, worked satisfactorily in every respect, so far as he could observe or ascertain. Nevertheless, it would seem that either on account of municipal restrictions or for other reasons, not readily apparent, the catenary contact lines for other projected a. c. single-phase railroads, which came to his notice, were limited to 2400 volts. He surmised that, notwithstanding the fact that so few break-downs of the contact line have occurred at Spindlersfeld, and that none of these break-downs caused any accident, there is still some feeling of "unrest" associated with the thought of a contact line of 6000 volts placed directly over the car or locomotive, and even though the probability of accident is very remote, yet, as long as the *possibility* thereof still remains, the "unrest" and the "objection" will doubtless persist. The double catenary, as Mr. Damon states, has the advantage of keeping the contact wire from swaying, but its increased cost does not appear to be always justified. With the "tower" method of construction, using long spans, the double catenary would probably be indispensable. With the ordinary trolley line form of suspension, where the distance between poles is not excessive, the single catenary would seem adequate and satisfactory for all purposes. At Spindlersfeld, the poles are placed about 39 m (about 128 ft.) apart. Both the single and the double-catenary suspension have been tried, and both have proved adequate and satisfactory.

The reference made by Mr. Damon to spectacular sparking when the contact line was coated with ice or sleet, emphasized a very strong and, in his opinion, a radical, inherent defect of any contact line arranged to deliver current from its lower side instead of its upper side. The fact that the sparking increases with the frequency of the trolley supports, in the cases observed by Mr. Damon, proves conclusively, it seems to him, that ordinary trolley line construction, using a trolley wheel for the contact, is wholly unsuitable for high potential contact lines. With the catenary suspension, even in the case of a trolley wheel, the sparking ought to be independent of the number or frequency of the line supports. The necessity of employing higher potentials for the transmission lines will obviously depend on the potential of the contact line. When this potential difference is as low as 3000 volts it would undoubtedly be still necessary to employ higher transmission potentials, in most cases, for interurban lines; but if the potential difference at the contact line is raised to 6000 volts, there are many cases where this potential would be sufficiently high for both transmitting and distributing purposes. When the contact line potential is raised to still higher values, say, for instance, 15,000 volts, the same potential difference will suffice, in a large number of cases, for both transmitting and distributing purposes. Indeed, if it were not for the convenience of subdividing the total line into blocks or sections, the contact line itself could serve as the feeder. Mr. Huber, of the Oerlikon Company, mentioned to the speaker a project for the equipment of a steam line in Switzerland, where it was proposed to supply 50 miles of track in both directions from a central station without feeders, simply using a duplicate contact line, one on each side of the track. This method has the advantage of providing a duplicate line equipment, which can still answer the purpose, at lower efficiency, though without materially crippling the service, in case of defect or derangement in either of the two contact lines.

The accompanying engravings illustrate the characteristic features of the high-potential, single-phase, a. c. electric railroad equipment of the Seebach-Wettingen line in Switzerland. This line, which is, in reality, a branch line of the Swiss National Railroad system, is about 20 km long, with single track, of standard gage. It has been operated by steam since it was first built, and will continue to be partly operated by steam for some time to come. When visited by the writer last summer, a portion of the line situated a short distance from the works of the Oerlikon Company was equipped electrically, and was used by the Oerlikon Company for making experiments with electric locomotives and with various forms of contact lines and line supports. It was then expected that the entire branch line would be equipped and operated electrically by November or December, 1904, but sufficient allowance had not, it seems, been made for official procrastination. The plans for the equipment of the Seebach station, for instance, were only approved some time in January.

The portion of the road equipped and the electric locomotive intended to be used were both inspected by the Federal authorities on Nov. 18, 1904. It would have been difficult to select worse weather, there being a thick, wet fog, which lasted all day. The results were entirely satisfactory, however, not the slightest defect being observed as the result of a great diversity of very severe tests of the line and of the electric locomotive. The only criticism offered by the officials related to the grade crossings, for which more adequate protection of the line was insisted upon, and for which danger and warning signs were prescribed; but even after all the requirements prescribed had been complied with, it was still necessary to have the government prepare or approve an official time-table before regular trips could be made with the electric trains. This official time-table was finally received on Jan. 13 by the Oerlikon Company, and since Jan. 16, 1905, seven trips have been made regularly each way over a short portion of the track, extending between Seebach and Affoltern.

It might be said in passing, that the process of securing the necessary approval and authority is not as simple as it may seem. Not only the plans, but even the details of the contact line equipped had to be submitted to and approved by numerous departments, including the general office and district department of the Federal Railways, the Federal Telegraph Department, the Railway Telegraph Department, the Commissioner of Public Works of the Canton and of the District, and, lastly, the corporations of the villages traversed by the line. In each case plans, descriptions and verbal explanations had to be submitted. Those who complain that projects are often delayed by "red tape" in this country will doubtless find comfort and consolation in learning that "red tape" apparently exists in other countries.

This case is interesting as being the first one in which the Huber contact line system, referred to by Mr. Damon, has been adopted. It is perhaps even more interesting and important as a pioneer movement toward the electrification of steam railway lines in Switzerland, for, apparently, both the Swiss Government and the Oerlikon Company are as much interested in the ulterior possibilities as in the immediate results; and in endeavoring to produce a satisfactory "sample" of electric traction as a substitute for steam traction for the specific conditions, both parties are evidently desirous, the former of testing, the latter of demonstrating, the general fitness of the system for all kinds of steam roads.

This may account, in a large measure, for the careful and time-consuming scrutiny which has been given by the authorities to every detail of the proposed equipment. The further development of the line is to proceed apparently in the same conservative and cautious manner. It has been decided that, for a certain time at least, the regular daily trips for which the official time-table has been issued will be made on the short portion of the line already equipped, before proceeding further with the electrification of the rest of the line.

The following is a quotation from remarks made by the writer before the New York Electrical Society last November, as published in the Street Railway Journal, Nov. 26, 1904:

"The electric train service proposed for this line will require eight trains, or four trains in each direction, per day. It is expected that this service can be done with one single electric locomotive. Each train will carry both freight and passengers, mostly freight. The estimated average train loads, not including the weight of the locomotive, are: 180 tons to 200 tons for trains running west, in which case the upgrades average about 0.8 per cent, and 150 tons to 170 tons for trains running east, in which case the upgrades average about 1.0 per cent. The average speed will be about 40 km per hour. There are seven stations on the line, including the two terminal stations. One of the present steam locomotives will be retained in service at first to run at least two more trains per day, one each way. This will be done partly to avoid the necessity of a second locomotive, but principally to enable the comparison between steam and electricity to be made under substantially the same operating conditions."

The following paragraph, which is a quotation from a reference made to the accompanying illustrations in a letter from Mr. Huber, of the Oerlikon Company, contains interesting details regarding various forms of contact line supports experimented with by him:

"From the photographs you will see that we are experimenting with different methods of carrying the trolley or contact wire over the poles. You will find (Fig. 1) the single wire held

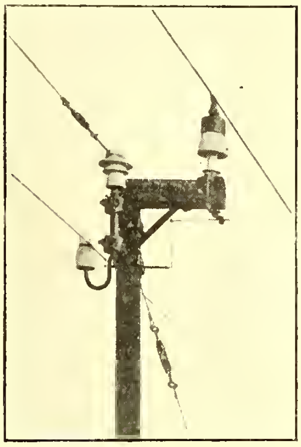


FIG. 1.—SINGLE WIRE HELD BY WIRE HOLDERS RIGIDLY SUPPORTED.

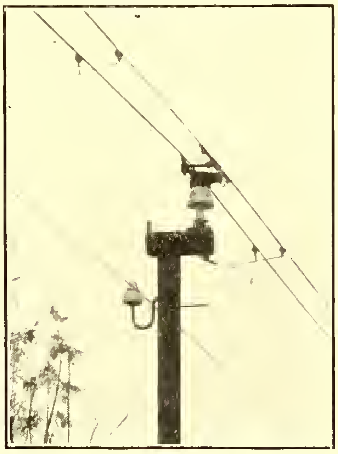
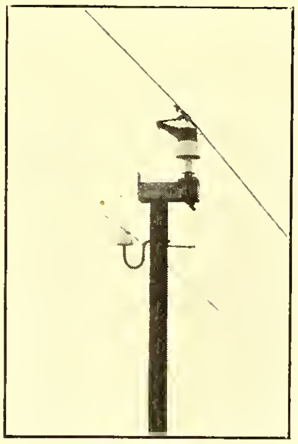


FIG. 3.—PAIR OF WIRES INTERCONNECTED BY LOOSE LINKS

by wire holders rigidly supported in the way which you know from our short experimental line inspected by you when here. Next you find (Figs. 2) a single wire held with clamps, to which a kind of lever is attached for securing the wire horizontally, while a spring made of steel wire, having some play vertically, supports the weight of the wire and takes up the hypothetical 'blows,' or the downward pressure, of the current collector. You will also find (Fig. 3) a pair of wires carried over the



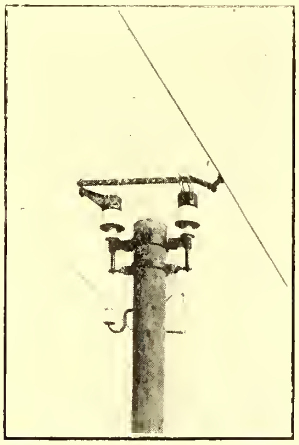


FIG. 2.—SINGLE WIRE HELD WITH CLAMPS WITH LEVER TO SECURE THE WIRE HORIZONTALLY

poles with the two wires interconnected by loose links. The inside wire is intended as the contact wire for the current collector, the outside wire as a reinforcement of the cross section or conductivity of the line. The outside wire, having a somewhat greater sag, is less likely to break, and will therefore constitute a safety suspension for the inside wire in case the latter should break near a support, it being then held above the ground by the interconnecting links just mentioned. The same principle of mutual safety suspension has been adopted for road crossings of small importance (Fig. 6). You will also find two different forms of 'inverted' catenary suspension, which have so far given excellent results (Figs. 4 and 5). This suspension has been used on about 5/4 km of length. During these last days, when the weather was very cold, the trolley or contact wire supported on these catenaries was so straight that the current collector showed no appreciable up and down motion. We have, however, come to the conclusion that this suspension, though it costs only about Frs. 200 per kilometer more

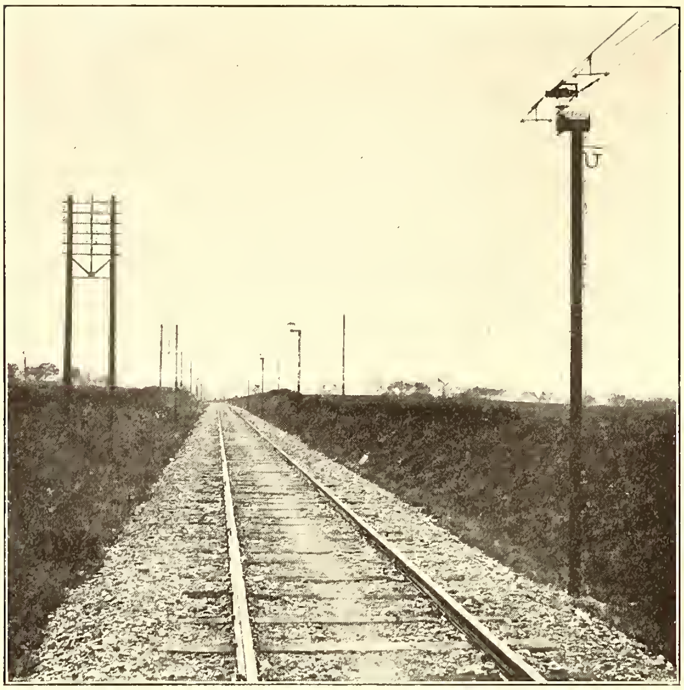


FIG. 4.—A SPECIMEN OF "INVERTED" CATENARY SUSPENSION

for erection, and hardly as much for material, will not be desirable for ordinary purposes. With two current collectors on the car there has never been any appreciable sparking in passing over the supports of the contact wire at the poles, with line construction of the types shown in Figs. 1 to 3."

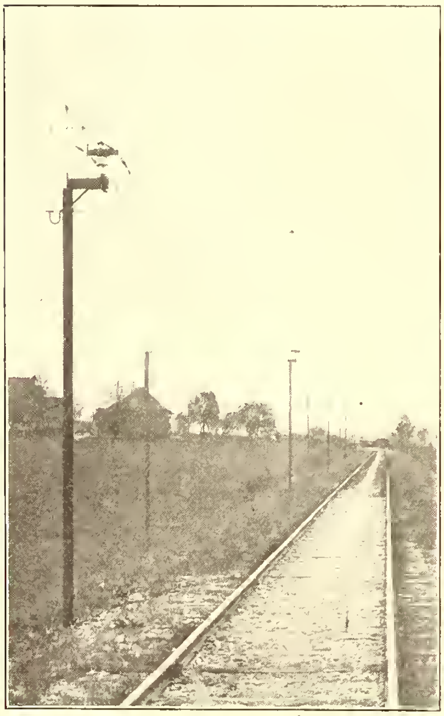


FIG. 5.—ANOTHER VIEW OF THE "INVERTED" CATENARY SUSPENSION

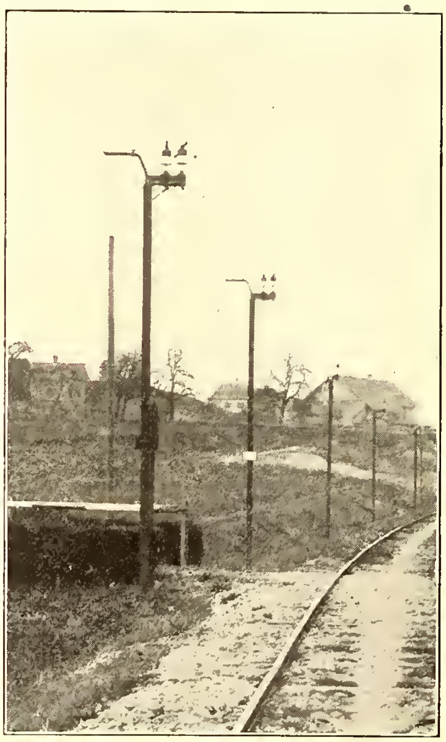


FIG. 6.—ARRANGEMENT OF THE CONTACT LINE AT AN ORDINARY CROSSING

FIG. 7.—ANGLE IRON BRIDGING STRUCTURE AT IMPORTANT CROSSING, TO CATCH BROKEN WIRES

Fig. 6 shows the arrangement of the contact line at an ordinary crossing. The arrangement is based on the form of contact line construction illustrated in Fig. 3, there being a pair of wires which are interconnected by loose links. The object is, obviously, to make provision for supporting the ends of one of the wires in case it breaks and to prevent the ends from reachings the ground. Fig. 7 shows a more elaborate form of road crossing. In this case there is placed over the road and under the wire a bridging structure made of angle iron which serves

FIG. 8.—LINE CONTACT CONSTRUCTION AT A STATION, OVER SWITCHES AND SIDE TRACKS

both to catch and to ground the ends of the broken line wire. In order to make the protection more adequate, a short section or "block" of the contact line itself, varying in length from 40 m to 70 m, according to the width of the crossing, has its connection with the source of electricity controlled by the gates in such manner that this short section is connected with the line wire only when the gates are closed and when a train is passing, it being entirely disconnected and "dead" when the gates are open, at which time the current passes through a short auxiliary line which is specially installed over the street crossing. The cost of an ordinary street crossing, such as shown in Fig. 6, is estimated at Frs. 600. The cost of a street crossing such as shown in Fig. 7 is estimated at Frs. 1,300.

Fig. 8 shows the line contact construction at a station, over switches and side-tracks. In this case the line construction is such that the current collector makes contact partly above,

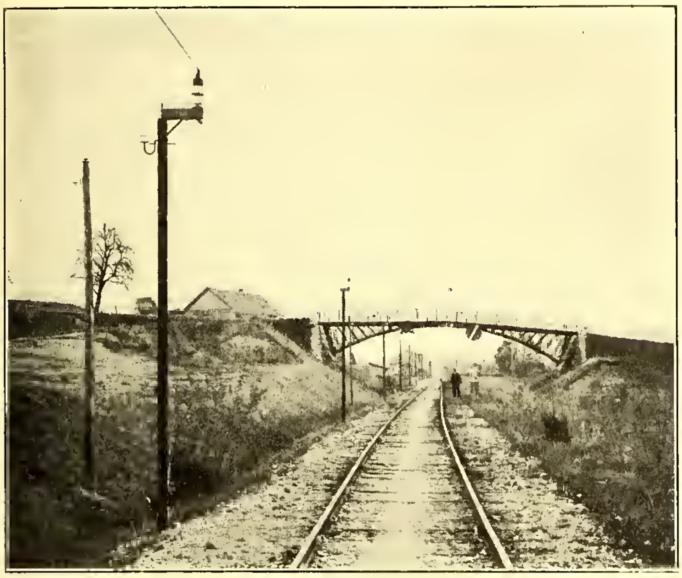


FIG. 9.—ILLUSTRATING AN INSTANCE WHERE A GOOD BRIDGE CLEARANCE MAKES UNNECESSARY THE SHIFTING OF THE CURRENT COLLECTOR PIVOT

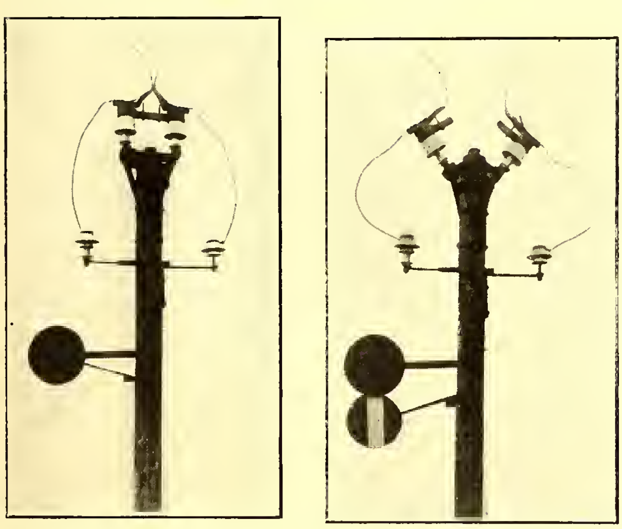
partly at the side and partly under the contact wire. It is proper to emphasize, at this point, the fact that while the Huber system is designed to permit the collector to take current from the contact wire, by touching it either below, on the side or above, the top contact is preferable and is the normal method.

The collection of current from the side or from below the contact wire is to be regarded as being, in reality, only an expedient, made desirable, necessary or indispensable, by certain conditions, especially limited clearance or space for trolley supports of any kind found in the average railroad tunnels; also in passing under bridges and at switches, side-tracks, etc. In the case of steam railroad lines only a relatively small percentage of the contact line would be other than that serving for top contact current collection.

Where a sufficient width can be arranged for under bridges and highways, the shifting of the pivot of the current collector may be readily eliminated. This has been done in the case illustrated in Fig. 9. It does not follow, therefore, that the shifting of the current collector, which has been criticised as one of the objectionable features of the Huber system, would be required in every case. Moreover, this device has now been brought to such a degree of perfection that its use is no longer a serious objection.

There will be noted on the larger illustrations a thin wire carried on ordinary insulators on the side of the pole away from the track. This wire forms part of a kind of "block" system devised by the Oerlikon Company. In the case of the Seebach-Wettingen line, the entire line will be divided into thirteen sections. The contact wire at or near each station will form a section or block, and the portion extending from one station to another will also constitute a section; hence, there being seven railway stations, including the terminal stations, it follows that there will be thirteen electrical sections or blocks in the entire distance of 20 km. The small wire shown in the illustrations, which is called the "cut-out" wire, or the "feeling" wire, is connected with a weatherproof fuse to each insulator pin. If the insulator begins to leak excessively, or if it actually breaks down, current flows through its pin, through the fuse, and is conveyed on the cut-out wire to the operating solenoids of certain line switches located at the ends of the sections. When the fuse is blown there is an explosive sound like that of a gun shot, serving to attract the attention of the guard men or station men, even at a considerable distance. After the fuse has blown, the fuse holder will hang from its support or suspension in a way which makes it visible even from a considerable distance. Thus any section or block on which there is a leaky or faulty insulator is automatically cut out. Some of the switches controlling the blocks or sections are placed on poles. Figs. 10 and 11 show one of these switches open and closed, respectively. Another form of section switch is shown in Fig. 12. The faulty insulator itself is located, first, by the audible signal, or the detonation of the fuse; second, by the visual signal, or the displacement of the fuse holder, and, incidentally, by the absence of the fuse from the fuse holder.

As Mr. Huber personally explained to the writer, it may be that some of these features will be found superfluous and that sufficient reliability in line equipment could be realized without some or all of them. It was deemed prudent, however, to develop and apply such devices, in this case, if only to meet the objection urged by steam railroad men that electrical troubles on a trolley line will be hard to detect, and that their removal would cause difficulty and delay. At the request of the writer, the experiment was tried of making an artificial ground at one of the line contact insulators, to simulate the case where the insulator breaks down and grounds the contact line. On making the artificial ground, the audible and visual signals were unquestionably such as would attract attention, even though the location of the pole were not definitely known. It took less than three minutes, by a watch, for a lineman to replace the damaged insulator by a new one and to have the current turned on again on the section of the line affected.



FIGS. 10 AND 11.—BLOCK CONTROLLING SWITCHES CLOSED AND OPEN

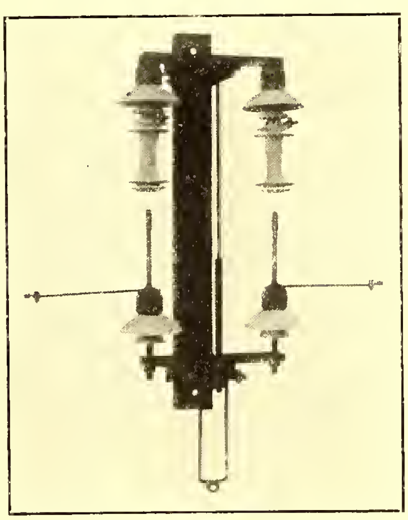


FIG. 12.—ANOTHER FORM OF SECTION SWITCH

Mr. Huber has paid close attention to, and has carefully studied, the requirements of the contact rod of the current collector which rubs against the contact wire. After trying different metals, he finds that tubes made of brass or composition answer the purpose very well. He has also succceeded in lubricating the rod, and he has resorted to the expedient of "zigzagging" the contact line for the purpose of reducing the wear on the contact rod and equalizing it, thereby preventing the rod from being "sawed" by the contact wire.

The top contact method of current collection is unquestionably superior to all others in sleety and frosty weather. On this point Mr. Huber furnishes interesting evidence in a brief comment on the results obtained since the portion equipped was put in regular operation: "The aggregate number of kilometers run, up to the present time (Jan. 25), is 450 km. The speed varies between 45 km and 50 km per hour. We have thus far always had to contend with a very large amount of frost on the wire during the first trip in the morning. The frost, owing to its nature, envelops the wire from all sides, while the sleet, which very often is produced from the frost, clings only to the underside of the wire. For this reason, on one day when the frost was exceptionally heavy, there was a continuous light sparking on the current collector, which, however, was without any influence upon the voltmeter and ammeter; and on the next trip the line was perfectly free from sparking, simply because the frost, as formed on the upper side of the wire, will always be inevitably wiped away by the current collector, while a cover of sleet will never be destroyed in the same way. It has also been observed that the sparking is very much heavier on those portions where the current collector touches the wire from the side or from below. It is therefore proved that with regard to frost and sleet on the wires the contact from the top of the trolley wire is a marked advantage."

In conclusion, the writer may state that after careful study of the Huber system, he has become a convert to and a partisan of the top contact theory for contact lines intended for long-distance traction. It seems to him that it possesses constructive and operative features which recommend it as preferable to the under contact system. The line leakage is bound to be lower than with the under contact catenary system. Not the least important of its recommendation is that of cost. He is convinced that if a comparison is made on the basis of equal mechanical and electrical results, also including cost of maintenance, the top contact method is so much lower in cost as to outclass the others. This is the more true the higher the line potential and the more perfect and adequate the insulation desired.

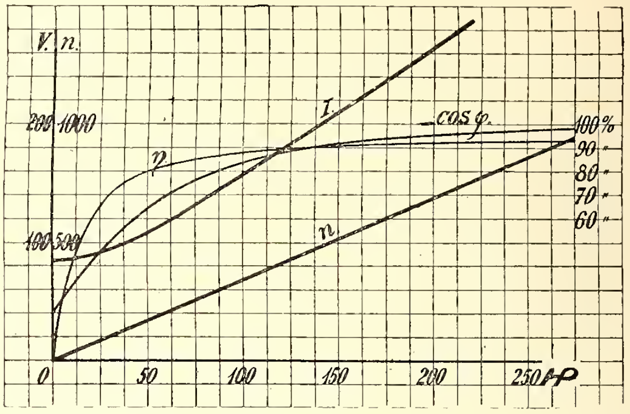
The impedance of the iron rails used for the track on this line has been carefully studied by the Oerlikon Company. Those who are interested will find an article on this subject in the "Electrotechnische Zeitschrift" of April 1, 1904, by Dr. H. Behn-Eschenburg, of the technical staff of the Oerlikon Company. It is found that the voltage loss due to impedance of the iron rail assumes such importance in some cases as to necessitate a special system of current return line, with special "booster" transformers for the track, of which an interesting form is described in the article just mentioned.

OERLIKON ELECTRIC LOCOMOTIVES

BY C. O. MAILLOUX

Two distinct, very interesting types of single-phase a. c. electric locomotives have been developed, and are to be tested, on the Seebach-Wettingen line in Switzerland by the Oerlikon Company. The first of these locomotives, designed about two years ago, and completed about a year ago, was run for many months on the company's experimental tracks at Oerlikon, near Zürich. On Jan. 16, 1905, it went into service and is now making regular schedule trips on the completed portion of the Seebach-Wettingen line.

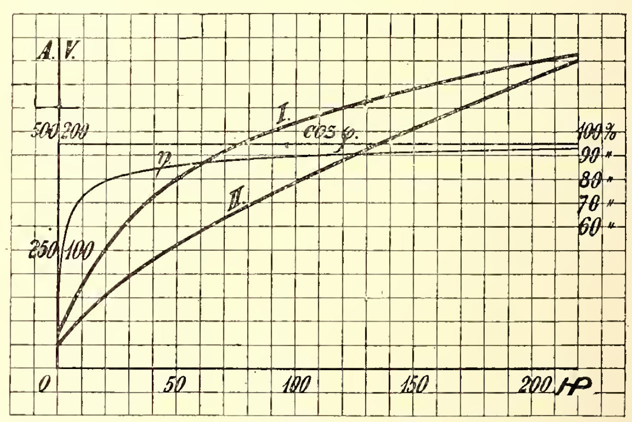
At the time when this locomotive was designed, the compensated series a. c. motor was still a "hypothesis," the a. c. repulsion motor and the plain series a. c. motor were only just beginning to "promise" results, and there was, to say the least, much skepticism regarding the feasibility of any system of a. c. single-phase electric traction. It is not surprising therefore, indeed, it was logical, that the design should be based on the retention of d. c. motors for propelling the locomotive and using some means of converting the a. c. into d. c. power. Considering that the design of large railway d. c. motors was still a problem, even after years of uninterrupted development of the d. c. railway motor in all sizes, the problem of designing a large



TEST CURVES OF 200-HP SERIES MOTOR WITH ALTERNATING CURRENT AT 15 CYCLES, RUN AT CONSTANT CURRENT (600 AMPS.). I = POTENTIAL DIFFERENCE, II = R. P. M.

a. c. railway was not an easy one; indeed, it is still difficult, it would seem, even to-day, notwithstanding the singularly rapid development of the a. c. single-phase railway motor, in all its forms, during the last year.

The equipment of the first locomotive includes a single-phase induction motor whose speed is about 980 r. p. m. when supplied with single-phase a. c. of 14,000 volts, with a frequency of 50 cycles per second. This motor serves for driving a 4-pole d. c. generator of 400-kw rating, to which it is direct-coupled, and it has to be kept running at constant speed so long as the



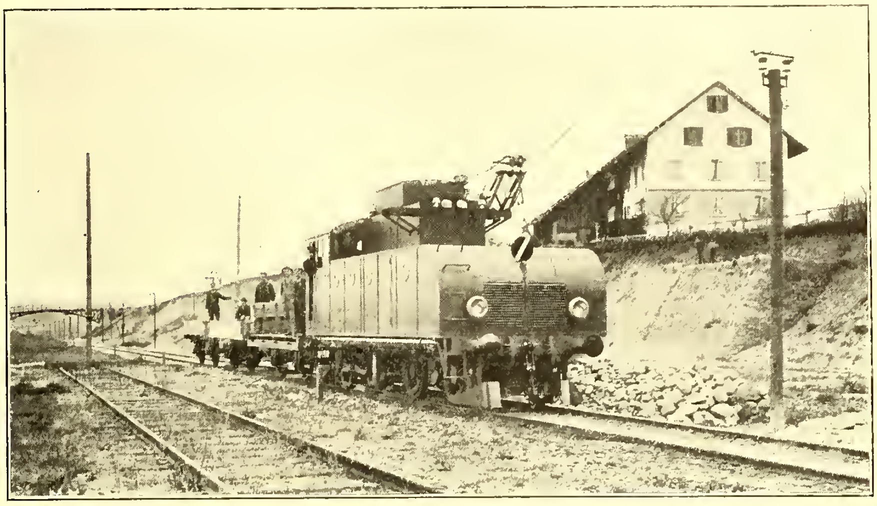
TEST CURVES OF 200-HP. SERIES MOTOR ALTERNATING CURRENT AT 15 CYCLES, RUN AT CONSTANT SPEED (650 R. P. M.). I = POTENTIAL DIFFERENCE; II = CURRENT STRENGTH

electric locomotive is in use. The "rotor" of this motor has a short-circuit "cage" winding. The "stator" has two windings, placed in distinct sets of slots, one designed for a potential difference ranging between 14,000 volts and 16,000 volts, and one designed for 700 volts. The first stator winding is that which is used when the current supply for the locomotive is taken from the "trolley line." The second stator winding was intended to be used when the current supply is taken from a "low potential" third rail or contact line, in case such an arrangement should be found desirable, at the station or in the switch yards. Thus far the latter winding has only been used experimentally. The high potential winding, in spite of being subjected to the severest strains, owing to the line circuit being suddenly opened either at the trolley or at the line section switches, has never shown the slightest weakness or defect.

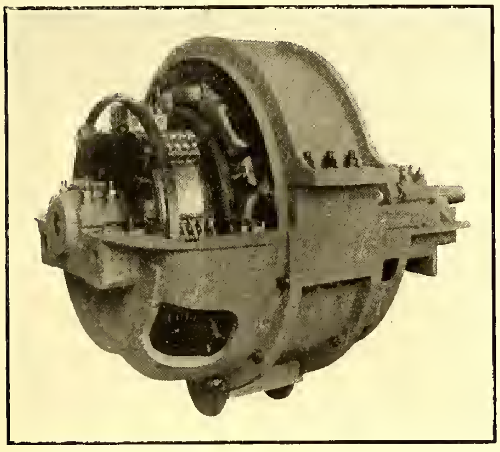
The efficiency of this motor is about 94 per cent, with a power factor of about 89 per cent, at full load. The dynamo is designed for a full load current of 650 amps. and a voltage which can be varied from 0 volt to 600 volts, by varying the field excitation, according to the so-called "Leonard" method. There is a small motor-generator set, of about 6-kw rating, on the locomotive, which normally serves for the excitation of the fields of the large generator, and also of the two axle-driving motors (which are d .c. of about 200-hp rating each).

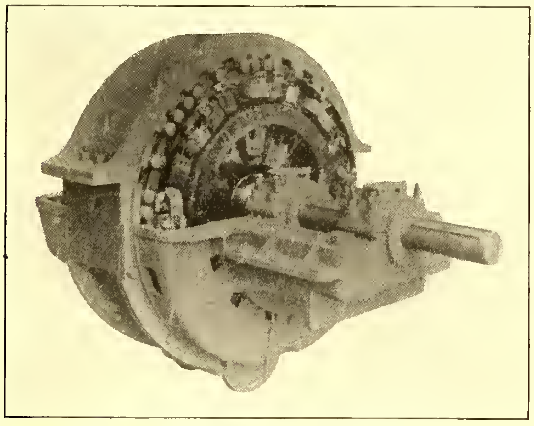
The large motor-generator set, consisting of the single-phase motor and the large d. c. generator, is kept constantly running, as already stated; but should it stop or "get out of step" for any reason (even for a moment), the small generator set can be used to bring it up to speed again, or even to start it from rest. For this purpose, if the exciter set itself is also stopped, the generator end of this small set is operated as an a. c. series motor, being then supplied with current from a special "tap" of the secondary of a small transformer carried on the locomotive. When it attains the synchronous speed, the a. c. end is connected to the transformer terminals and the motor can then drive the d. c. generator. The current from the d. c. end is sent into the d. c. end of the large set, which then operates as a motor. When synchronous speed has been attained in the large motor-generator set, the stator of the large motor is connected with the contact line. It takes about two minutes from the time the small motor is started until the large d. c. generator is ready to furnish current for the two axle-driving motors.

In spite of the fact that this system involves the transformation of a. c. into d. c. electric power, its efficiency will compare well with that of any other system, either d. c. or a. c., especially in a case where the number of stops is relatively frequent. The reason for this is that the losses occurring in the motor-generator set itself are compensated by the greater efficiency of the method of speed control made possible with the equipment. While the electric power is taken from the contact line at constant potential, it is made available for the motor (after being converted into d. c. power) at variable potential, without the intervention of resistance in the armature circuits of the axle-driving motors. When starting, for instance, even though the torque required is very great, the power taken from the line, instead of being a maximum, is very low, being, in fact, nearly or practically a minimum. The electromotive force of the large d. c. generator is then very low, being only what is needed to overcome the resistance of the motor armatures and to send the required torque-producing current through them. The writer tried the experiment of blocking the wheels of one of the cars attached to the electric locomotive, in order to "stall" the locomotive and allow the maximum draw-bar pull to be developed. Although the current sent into the d. c. motors from the d. c. generators was over 600 amps., the electromotive force of this generator was still so low that its value could scarcely be read on the voltmeter, and the a. c. motor took so little current from the contact line that the a. c. ammeter scarcely moved, the current being apparently not over, more probably under, 5 amps. When starting and running under normal conditions, the speed is increased and regulated by raising and regulating the electromotive force of the d. c. generator, this being done by simply varying the shunt-field resistance of the d. c. generator. Hence, as there is a large number of "steps" in the shunt-field rheostat, it follows that there are more "graduations" of speed than when armature rheostatic control is used. The smoothness of the acceleration, the absence of jerks when starting, or when the speed is changed, are one of the striking features of the operation of this electric locomotive.



SINGLE-PHASE LOCOMOTIVE WITH HUBERT CONTACTOR NOW IN SERVICE ON THE SEEBACH-WETTINGEN LINE, SWITZERLAND



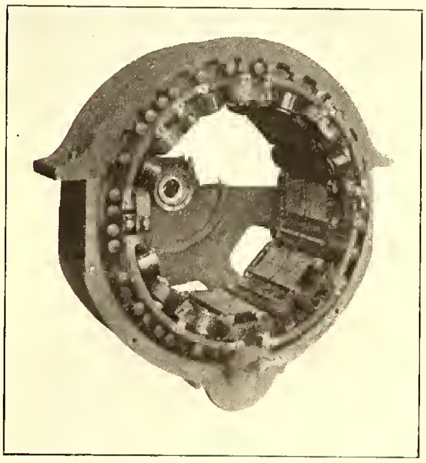


VIEWS OF COMMUTATOR AND PINION ENDS OF 200-HP INTER-POLE MOTOR

The extra weight of the motor-generator outfit (about 10 metric tons) is not of so much consequence as might be thought, since, it is well known, there is required, in a locomotive, a certain minimum weight over the "drivers" in order that the "adhesion" may be sufficient to prevent "slipping" when the maximum draw-bar pull is exerted. In this case this weight would have had to be provided in some other way, if the motor-generator outfit had been eliminated. The most objectionable feature of this outfit is, in reality, the necessity of keeping it constantly running while the locomotive is in use, and the possibility of its falling out of step and coming to a stop whenever the current supply from the contact line is interrupted, even for a very short time.

The second electric locomotive, also of 400-hp rating, to be tried by the Oerlikon Company on the Seebach-Wettingen line, will be equipped with two single-phase a. c. motors, each of

200-hp rating. As steps preliminary to the design and construction of this motor, railway motors of smaller size were first developed and carefully tested. Some very interesting tests were made last fall with one of these motors of 35-hp rating. This motor, which is now on the market, presents peculiarities of design which entitle it to the distinction of being literally an "all around" railway motor. It is 6-poled, designed for a maximum speed of 1000 r. p. m., and weighs about 1000 kg (2204 lbs.) without gearing. The field magnet ("stator") has two sets of winding coils mounted on different polar projections. One of these windings corresponds to the usual series winding serving for excitation, and the other winding serves for "compensation." There is no resistance in the commutator connections. The air gap is 1 mm. This motor is designed for use, and it was tested, in four different ways, namely: First, as a plain d. c. series motor, being then run with 200 volts potential difference at its terminals; second, as a simple a. c. series motor, with a current of 200 volts, the frequency being varied between 1 period and 25 periods per second; third, as a simple repulsion motor, with a current of 230 volts, of frequency ranging between 40 periods and 50 periods per second; fourth, as a compensated series motor of the "Latour" type, having both "excitation" brushes and "short-circuit" brushes. Each particular test included a four-hour run, during which the performance of the motor was carefully studied. The conditions were maintained as nearly as possible alike for all the tests, the standard for the comparison of results and of operation (especially in regard to sparking, heating, etc.) being a first-class d. c. motor of the same rating. The results obtained were found to compare favorably with the "standard" in every case. The maximum rise of temperature in either field or armature winding did not exceed 45 degs. C. in any case. The efficiency of the d. c. motor was about 3 per cent higher, however. The power factor was found to be about 3 per cent higher when the motor was run as an a. c. "series" than when run as a "repulsion" motor. Between 800 r. p. m. and 1000 r. p. m., the commutation was about the same for all four cases. Below 500 r. p. m. and above 1000 r. p. m., the series arrangement, both a. c. and d. c., was also satisfactory, while with the repulsion and the compensation forms of motor, special devices had to be resorted to in order to reduce the short-circuit potential difference at the commutator. This motor is suitable for use on d. c. lines, or on a. c. single-phase lines of low frequency (under 25 periods per second) when arranged and used as a plain series motor; and it is also suitable for a. c. lines of higher frequency when arranged and used either as a repulsion motor or as a compensation motor.



FIELD OF 200-HP INTER-POLE MOTOR

The 200-hp motors destined for the second electric locomotive are of the same general type, with certain modifications, being designed more for specific than for general or varied conditions of operation. These motors are intended more especially to be used as a. c. series motors with a current of 15,000 volts, having a frequency of 15 periods per second. Each motor weighs 3000 kg (6612 lbs.). The motor is designed for maximum speeds ranging between 650 r. p. m. and 1000 r. p. m. In this case the gear ratio will be 1 to 3.1. The maximum locomotive speed will be about 50 km (30 miles) per hour. The motor is 8-poled, with "inter-poles" for the compensation winding. The exact arrangement of the field magnet and windings, and the special means employed for improving the commutation of this motor have not yet been made public by the Oerlikon Company.

Although this motor was not designed for d. c. work, it was, nevertheless, also tested as a d. c. motor, and found to give satisfactory results in every respect. When supplied with a. c., the motor develops its rated horse-power at 650 r. p. m. with 260 volts and 600 amps. The commutation is good at all speeds up to 1100 r. p. m., with frequencies ranging between 15 periods and 22 periods per second and a torque equal to a draw-bar pull of 300 kg (661 lbs.) per motor. There is not the least sparking or efficiency loss noticeable due to the short-circuit voltage at the brushes, which for a torque equal to a draw-bar pull of 200 kg (441 lbs.) is about 2 volts. The carbon brushes are 10 mm (.39 ins.) thick. The results of the tests with a. c. are shown in Figs. 2 and 3. The power factor is 94 per cent at 650 r. p. m. and 97 per cent at 1000 r. p. m. for all loads when the frequency is 15 periods per second, and it is 87 per cent and 93 per cent, respectively, with a frequency of 25 periods per second. The increase of the torque to an equivalent draw-bar pull of 350 kg (770 lbs.) involves an increase of the magnetic field and of the short-circuit voltage at the brushes amounting to about 12 per cent.

Experiments are also projected by the Oerlikon Company with an a. c. motor of the same rating, suitable for a. c. of higher frequency. This motor will have outwardly the same appearance as the motor just described. The armature will be exactly the same, the field winding being arranged and proportioned somewhat differently, so as to adapt the motor for use either as a repulsion motor or as a "compensated" motor, to be supplied with a. c. of 40 periods to 50 periods per second.

It is seen from these details that the Oerlikon Company has studied, considered, and intends to test, the possibilities of all forms and methods of a. c. single-phase electric traction which hold forth any promise. The motor equipments which have been mentioned will, without doubt, enable the engineers of the company to make comprehensive tests over the whole range or scale of frequencies with all the types and modifications of single-phase railway motors now attracting attention. The company deserves much credit and commendation for its enterprise in adopting the expensive but very comprehensive and far-reaching electric plan of "proving all things" in its search after the "best" thing. It deserves, and let us hope it will attain, complete success.

One of the most remarkable plans ever suggested by Henry E. Huntington for beautifying the roadbeds of the many lines he owns running out of Los Angeles into various parts of Southern California has proved a dismal failure. About a year ago he had conceived the idea of lining the roads with golden poppy. Accordingly, last fall, he had sown 600 lbs. of choice German poppy seed, but it cannot now be ascertained that a single seed of this enormous sowing has ever sprouted. To be terse, not a poppy has "popped," and the flower-bedecked roadway still is only a golden dream. The heavy rains of the winter have made the wild flowers of the fields one glad song of color.

J. O. Wilson, general passenger agent of the Cleveland & Southwestern Traction Company, has organized the Cleveland & Southwestern Trolley League and has been elected president of the organization. The league will support baseball teams in Medina, North Amherst, Elyria, Norwalk, Lorain, Wellington, Wooster and two in Cleveland. Regular scheduled games will be played from May 15 to Sept. 15. The circuit has been a success during the past two years, and it is better organized than ever this season.

ACCIDENT RECORDS AND DISBURSEMENTS AT MILWAUKEE

As many of the readers of this paper know, the Milwaukee Electric Railway & Light Company has given especial attention to the conduct of its accident claim department. For a number of years the policy of the company has been to ascertain first whether or not the company is liable for each particular accident, and if this is the case to make every effort to settle the claim out of court, if it can be done upon anything approaching a reasonable basis. The result is that the company has comparatively few cases in the courts, and when it is obliged to go into court it does so with a very fair certainty of winning its case. That this policy has been a satisfactory one is shown by the remarkable record of suits tried, as reproduced in Table I. herewith. This table shows that during the year ending Dec. 31, 1904, only thirteen suits reached a point in the court where judgment was rendered, and that all of these suits were decided in favor of the company. This record is probably not equaled by any other company in the country, and is certainly remarkable when the size of the Milwaukee system is considered. The table also shows that only sixty-five suits were pending on Dec. 31, 1904, a reduction of fourteen over those of the previous year.

In some respects this record is assisted by the State laws of Wisconsin, which hold that a motorman is not obliged to exercise the highest degree of skill and prudence; it is sufficient if he exercises the care of a person of average prudence under the same or similar circumstances. In an article which was published on page 903 of the issue of this paper for June 20, 1903, two Wisconsin cases were quoted to illustrate the degree of care required by the railway company in the operation of its cars, and there is no doubt that these reasonable laws have had a tendency to make the public more careful while crossing the streets.

A classification of accidents by months is shown in Table II. As will be seen, the principal cause for accidents has been in alighting and boarding cars, and the next most prevalent cause has been collisions with vehicles. In fact, these two causes account for over 52 per cent of the accidents. The amount paid out for these two classes of accidents was slightly in excess of their numerical proportion—that is, it was about 55 per cent.

Table III. gives a comparison for the last three years of the amount of old claims settled and those settled during the current year, and illustrates very clearly the point already mentioned, viz., the policy of the company in taking up and settling claims as promptly as possible. It also shows that the cost of

Table I.—Report of Claim Department 1904.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	U	V	Y	Total	Settled	Expenditures
January	74	19	7	0	22	8	56	8	18	31	28	15	3	0	1	4	4	0	0	298	62	7,597.05
February	93	16	8	0	27	8	82	6	16	21	31	11	10	2	1	2	5	0	0	339	58	2,297.75
March	82	12	8	0	28	21	11	21	6	20	58	8	4	1	1	3	2	1	1	388	79	3,309.99
April	77	13	7	4	30	16	113	13	9	7	37	5	2	7	5	7	4	1	5	362	81	6,195.02
May	63	19	18	10	22	6	159	6	9	17	49	11	3	1	5	3	11	1	14	427	85	2,644.37
June	59	20	12	8	17	17	121	8	12	12	39	6	2	3	5	4	11	0	5	361	68	4,145.88
July	78	11	17	8	25	22	167	10	24	20	39	8	6	0	7	5	9	1	7	464	100	1,654.55
August	72	12	5	7	30	29	143	3	15	15	40	7	2	2	8	3	8	0	10	411	103	5,876.14
September	63	16	11	4	18	16	169	14	8	21	42	8	9	2	4	3	2	0	7	417	82	1,969.53
October	99	11	10	4	17	17	155	11	19	25	35	6	6	4	5	7	11	2	9	453	103	2,978.67
November	76	11	6	1	15	11	152	11	12	20	32	10	6	1	2	6	8	1	3	374	95	11,337.63
December	87	11	9	1	26	7	93	16	18	12	55	10	6	2	4	4	6	0	0	367	76	8,936.89
Total	923	171	118	47	277	178	1511	127	166	221	485	105	59	25	48	51	81	7	61	4661	992	58,943.47

Suits pending December 31, 1903		79		
Suits instituted		51	130	
Suits tried, judgment for plaintiff	0			
Suits tried, judgment for defendant	13	13		
Suits discontinued by plaintiff		0		
Suits settled out of court, included in statement above		33		
Suits dismissed for want of prosecution		3		
Suits apparently abandoned		16	65	
Suits pending December 31, 1904			65	
Attorneys' salaries and fees			7,775.00	
Briefs and transcripts			423.73	
Court fees and expenses			120.76	
Witness fees and expenses			707.19	9,026.68
Claim department salaries				7,485.00
Incidentals, office expenses, etc				3,134.91
Physicians' salaries and fees				4,592.00
Hospital expenses and medicines				1,148.46
Total Expenditures During Year 1904				84,330.52
Note.—Twenty-six fatal accidents during year 1904, of which seven were settled at a total cost of				3,375.00

KEY TO CLASS RECORD

A.—Collision with Vehicles.
B.—Collision with Persons.
C.—Collision with Animals.
D.—Collision with Bicycles.
E.—Collision with Cars.
F.—Cars Leaving Track.
G.—Alighting or Boarding Car.
H.—Fell in, on or off Car.
I.—Disturbance on Car.
J.—Car Equipment Burn-outs.
K.—Miscellaneous.
L.—Employees Injured When on Duty.
M.—Power Plant.
N.—Lighting.
O.—Way.
P.—Shops.
U.—Utility Equipment.
V.—Gravel Pit, Crusher, Stable, etc.
Y.—Construction, Reconstruction, etc.

CLAIM DEPARTMENT.

Table III.—Comparison Year 1902, 1903, 1904

Year	Gross Earnings	Old Claims Settled				Current Year				Total			
		Expended	Cases	Per Case	Per Cent Earnings	Expended	Cases	Per Case	Per Cent Earnings	Expended	Cases	Per Case	Per Cent Earnings
1902	3,092,083.28	13,064.02	51	251.16	.42	38,783.30	623	62.25	1.25	51,847.32	674	76.90	1.67
1903	3,453,378.59	52,360.91	85	616.01	1.51	50,308.34	789	63.76	1.46	102,669.25	874	117.47	2.97
1904	3,680,649.62	24,447.49	67	364.89	.66	59,883.03	925	64.74	1.63	84,330.52	992	85.01	2.29

taking care of the injuries and damages during 1904 was only 2.9 per cent of the gross receipts.

Table IV. is another interesting statement, and shows how the accounts are kept in the different departments by months and by years. It is the policy of the company to charge off 4 per cent of the gross receipts of its railway department monthly to the credit of injuries and damages, and of the lighting account ½ per cent of the gross monthly receipts. For the other branches of the construction work the company carries a certain percentage, depending upon the amount of work done, so that there will be no doubt as to the actual cost of construction work. This practice accounts for the credit claims shown in Table IV. As will be seen, the balance credited for the year to date was $49,207.88, which with the interest on the previous reserve fund made a total credit to the fund for the year of $56,012.05, or a total fund at the end of the year of $191,508.08. To the credit of the fund the company has now invested $200,000 par value of 5 per cent bonds of the Milwaukee Light, Heat & Traction Company, having a market value of 105 per cent.

Statistics similar to the above, but for the year 1902, were published in the article in June 20, 1903, already mentioned.

TABLE II.—ACCIDENTS REPORTED AND EXPENDITURES DURING YEAR 1904.

Accidents During Year 1904.	Class Total	Disbursements Year 1904 for Accidents Occurring in the Years Specified.								Total
		1897	1898	1899	1900	1901	1902	1903	1904	
Collision with vehicles	923	......	......	......	2,575.00	500.00	100.00	367.40	12,275.48	15,817.88
Collision with persons	171	......	......	......	....	......	1,242.95	295.00	1,829.20	3,367.15
Collision with animals	118	......	......	......	....	......	....	....	....	....
Collision with bicycles	47	......	......	......	....	......	....	15.00	37.00	52.00
Collision with cars	277	......	......	......	....	......	....	650.00	2,902.00	3,552.00
Cars leaving track	178	......	......	......	....	225.00	....	150.00	712.25	1,087.25
Alighting or boarding car	1,511	......	......	262.50	600.00	......	1,650.00	3,565.00	10,882.20	16,959.70
Fell in, on or off car	127	......	......	......	....	......	....	150.00	1,499.00	1,649.00
Disturbance on car	166	......	......	......	....	......	2,000.00	....	655.00	2,655.00
Car equipment burn-outs	221	......	......	......	....	......	....	4,346.00	2,813.34	7,159.34
Miscellaneous	485	......	......	......	....	......	53.85	268.00	844.95	1,166.80
Employees injured when on duty	105	......	......	......	....	......	37.00	1.00	94.26	132.26
Power plant	59	......	......	......	....	......	....	26.25	47.50	73.75
Lighting	25	......	......	......	....	......	....	1,700.00	*456.35	2,156.35
Way	48	......	......	......	....	......	....	134.80	....	34.80
Shops	51	......	......	......	....	......	....	134.63	....	134.63
Utility equipment	81	......	......	......	....	......	875.00	1,567.20	632.00	3,074.20
Gravel pit, crusher, stable, etc.	7	......	......	......	....	......	....	....	5.69	5.69
Construction; Reconstruction; etc.	61	d 134.33	......	......	....	......	....	....	....	d 134.33
TOTAL	4,661	d 134.33	......	262.50	3,175.00	725.00	5,958.80	13,100.85	35,855.65	58,943.47
Claim department salaries	....	......	......	......	....	......	....	....	7,485.00	7,485.00
Incidentals, office expenses, etc	....	......	......	......	10	31.45	112.15	93.47	2,897.74	3,134.91
Attorneys' salaries and fees	....	......	......	......	....	30.00	....	160.00	7,585.00	7,775.00
Physicians' salaries and fees	....	......	......	......	10.00	10.00	....	119.00	4,453.00	4,592.00
Hospital expenses and medicines	....	......	......	......	....	......	....	148.70	999.76	1,148.46
Court fees and expenses	....	......	......	......	d 43.27	d 9.05	136.41	d 10.74	47.41	120.76
Witness fees and expenses	....	......	89	25.00	26.26	75.63	168.49	74.50	336.42	707.19
Briefs and transcripts	....	......	5.00	......	28.55	97.28	58.10	11.75	223.05	423.73
Total claim department expenses	....	......	5,89	25.00	21.64	235.31	475.15	596.68	24,027.38	25,387.05
Total disbursements	....	d 134.33	5.89	287.50	3,196.64	960.31	6,433.95	13,697.53	59,883.03	84,330.52
DISTRIBUTION:										
Operation	....	d 134.33	5.89	287.50	3,196.64	960.31	5,483.33	12,154.67	59,092.57	81,046.58
Utility, gravel pit, crusher, etc	....	......	......	......	....	......	950.62	1,542.86	790.46	3,283.94
	....	134.33	5.89	287.50	3,196.64	960.31	6,433.95	13,697.53	59,883.03	84,330.52

d = credit.

TABLE IV.—STATEMENT OF INJURIES AND DAMAGES, RESERVE ACCOUNTS, DECEMBER 31ST, 1904.

	Current Month			Year to Date			Balance
	Credited	Charged	Increase or Decrease	Credited	Charged	Increase or Decrease	
Railway	10,763.65	10,455.88	307.77	123,305.09	78,597.75	44,707.34	164,224.66
Lighting	350.39	504.10	d 153.71	2,990.12	2,448.83	541.29	14,666.79
Utility equipment	200.80	3.50	197.30	4,921.41	3,278.25	1,643.16	d 5,193.21
Gravel pit	21.67	....	21.67	1,499.58	....	1,499.58	2,220.86
Crusher	1.71	....	1.71	111.65	....	111.65	213.78
Stable	28.82	....	28.82	348.45	....	348.45	1,061.11
Cast welding	....	5.69	d 5.69	362.10	5.69	356.41	613.86
	11,367.04	10,969.17	397.87	133,538.40	84,330.52	49,207.88	177,807.85
Reserve fund interest	....	....	....	8,050.00	1,245.83	6,804.17	13,700.23
	11,367.04	10,969.17	397.87	141,588.40	85,576.35	56,012.05	191,508.08

d = credit.

H. S. Kneedler, advertising and industrial agent of the Pacific Electric Railway Company, has issued a pretty pictorial pamphlet for the benefit of tourists who desire to visit places out of Los Angeles, along the beaches and in the mountains.

SCHEDULE IMPROVEMENTS CONTEMPLATED IN CLEVELAND

In line with its plan of building subways in the downtown district, the officials of the Cleveland Electric Railway believe that the schedules on all lines could be greatly improved by having cars stop only at certain street crossings instead of at all street crossings as at present. In portions of the city where streets are close together, this is a great hardship on motormen, and it makes slow traffic. General Manager Stanley has submitted to the City Council changes proposed for two of the most important lines and will request permission to make a trial of the plan. On the Euclid Avenue line he proposes to eliminate about sixteen stopping points, and on the Broadway line about twenty-five. Mr. Stanley desires particularly to eliminate the practice of making two stops at streets where lines intersect. The law requires that cars stop on the second crossing of all streets, and it also requires that cars make emergency stops at the first crossings of streets where there are intersecting lines. People frequently get on and off at the first stop, while others go to the second crossing, making many annoying delays. The city officials have agreed to co-operate in the matter.

Work has been commenced on the construction of a municipal tramway and electric lighting system in Freemantle, Western Australia. The engineer in charge is F. A. McCarty, of Noyes Brothers, of Melbourne.

THE CENSUS REPORT ON STREET RAILWAYS—III.

Chapter VI. of the new census report on street railways is devoted to employees, salaries and wages, and statistics are given for 797 of the 817 operating companies, 20 companies failing to render reports. In accordance with the practice adopted by the Bureau of the Census for the investigation of manufacturers, the average number of employees stated in the accompanying tables is computed, not on the basis of the actual time the street railways were in operation, but on the assumption of continuous operation for all companies throughout the year. Thus a company operating six months and employing thirty men during that time is credited with fifteen men employed for twelve months. The aim is to show the equivalent of the actual work done during the census year, or, in other words, the number of employees which would be necessary to perform that work if all of them worked the full year.

The average time of operation of the fifty-seven companies which operated less than the full year was about six and two-thirds months. The number of employees of such companies, as calculated according to the method described was only 2066, so that it was only a small fraction of the total.

The average number of salaried officials and clerks employed by the street railways of the United States in 1902 was 7128, and the average number of wage-earners of all classes, 133,641, a total of 140,769 employees. The salaries paid amounted to $7,439,716, and the wages to $80,770,449, a total of $88,210,165 for salaries and wages. The wages alone, exclusive of salaries, were 56.8 per cent of the total operating expenses of the street railway companies. By far the most important groups of employees are, of course, conductors and motormen. These two classes, which are approximately equal in number and in wages received, together constitute about three-fifths of the total number of wage-earners, and their aggregate wages are equal to more than one-third of the operating expenses of street railway companies. Road and track men and mechanics are the next most important classes of employees.

For all classes of railways combined—that is, those with and without commercial lighting, steam, animal, cable and electric—the number of salaried employees was 0.322 per mile of track, 0.631 per 100,000 car-miles run during the year, and 0.151 per 100,000 fare passengers carried during the year. The number of wage-earners was 6.031 per mile of track, 11.830 per 100,000 car-miles, and 2.829 per 100,000 fare passengers. These figures exceed slightly the averages for the purely full-time electric surface railways without commercial lighting, whose detailed statistics are given herewith. The annual wages paid by all companies were $3,645 per mile of single track, $7,150 per 100,000 car-miles, and $1,710 per 100,000 fare passengers. As might be expected, the companies furnishing commercial lighting, part of whose employees are engaged in the lighting branch of the business, show relatively more salaried employees, wage-earners and wages, in proportion to the car mileage and passengers, than companies without commercial lighting. In accordance with the practice adopted in this series of abstracts, only the statistics for full-time electric railway companies are reproduced, classified according to population.

In explanation of the fact that the number of employees per 100,000 car-miles is greater in large cities than in smaller towns, it may be said that certain classes of men, such as starters, switchmen, transfermen at junction points, and the like are not required in the smaller towns. In some small towns

TABLE SHOWING EMPLOYEES, SALARIES AND WAGES OF FULL-TIME ELECTRIC SURFACE RAILWAY COMPANIES, WITHOUT COMMERCIAL LIGHTING, CLASSIFIED ACCORDING TO POPULATION: 1902*

	Total.	Urban Centers, Population				Interurban Railways	
		500,000 and over.	100,000 but under 500,000.	25,000 but under 100,000.	Under 25,000.	Fast, long.	Other.
Number of companies	554	47	37	66	165	40	199
Salaried officials and clerks:							
Average number	5,617	2,259	1,026	457	438	356	1,081
Per mile of track	0.305	0.483	0.318	0.219	0.335	0.165	0.217
Per 100,000 car miles run during the year	0.598	0.522	0.469	0.555	1.141	0.985	0.830
Per 100,000 fare passengers carried during the year	0.140	0.107	0.114	0.150	0.351	0.432	0.216
Salaries	$5,950,926	$2,390,778	$1,293,521	$537,295	$340,658	$371,944	$1,016,730
Wage-earners:							
Average number	111,044	53,957	24,649	8,709	4,008	4,329	15,392
Per mile of track	6,022	11,527	7,642	4,167	3,062	2,002	3,096
Per 100,000 car miles run during the year	11,826	12,461	11,260	10,577	10,445	11,980	11,819
Per 100,000 fare passengers carried during the year	2,768	2,566	2,747	2,852	3,210	5,249	3,082
Wages	$67,904,546	$34,094,449	$15,325,583	$5,256,287	$2,163,300	$2,432,536	$8,632,391
Per mile of track	$3,683	$7,284	$4,751	$2,515	$1,653	$1,125	$1,737
Per 100,000 car miles run during the year	$7,232	$7,874	$7,001	$6,384	$5,637	$6,732	$6,628
Per 100,000 fare passengers carried during the year	$1,692	$1,621	$1,708	$1,721	$1,733	$2,949	$1,729
Conductors:							
Average number	34,222	16,765	7,847	2,821	1,165	998	4,626
Wages	$20,981,435	$10,670,686	$4,745,919	$1,697,605	$619,268	$552,534	$2,695,423
Motormen:							
Average number	34,458	16,338	8,060	2,959	1,421	1,049	4,631
Wages	$21,288,717	$10,509,465	$4,903,873	$1,790.580	$764,662	$583,345	$2,736,792

*Exclusive of reports for 18 companies which failed to furnish this information.

TABLE SHOWING WAGE-EARNERS AND SALARIED EMPLOYEES OF SURFACE RAILWAYS, IN THE TEN LARGEST CITIES: 1902

City.	Number of miles of track.	Total car mileage	Number of fare passengers.	Salaried Officials and Clerks.				Wage-earners.			
				Number.	Per mile of track.	Per 100,000 car miles per year.	Per 100,000 fare passengers. per year.	Number.	Per mile of track.	Per 100,000 car miles. per year.	Per 100,000 fare passengers. per year.
New York, N. Y.	1,103.45	136,179,817	718,278,032	614	0.556	0.451	0.085	20,627	18.693	15.147	2.872
Chicago, Ill.*	886.86	74,011,090	305,905,617	283	0.319	0.382	0.093	7,426	8.373	10.034	2.428
Philadelphia, Pa.	517.53	61,521,375	331,304,685	258	0.499	0.419	0.078	6,980	13.487	11.346	2.107
St. Louis, Mo.	360.89	29,602,974	122,063,877	138	0.382	0.466	0.113	2,438	6.756	8.236	1.997
Boston, Mass	406.13	45,999,999	222,484,811	450	1.108	0.978	0.202	6,769	16.667	14.715	3.042
Baltimore, Md.	365.12	23,876,837	96,763,878	139	0.381	0.582	0.144	2,762	7.565	11.568	2.854
Cleveland, Ohio	237.04	18,768,515	81,370,202	95	0.401	0.506	0.117	2,104	8.876	11.210	2.586
Buffalo, N. Y.	320.48	17,486,012	74,136,881	105	0.328	0.600	0.142	2,259	7.049	12.919	3.047
San Francisco, Cal.	276.50	20,620,581	117,357,877	102	0.369	0.495	0.087	2,957	10.694	14.340	2.520
Pittsburg-Alleghany, Pa	410.01	33,067,964	161,436,822	155	0.378	0.469	0.096	4,016	9.795	12.145	2.488

* One company failed to furnish this information.

a single person serves both as conductor and motorman. On the other hand, the density of traffic per car-mile increases, broadly speaking, with population, and we find accordingly that the ratio of the number of employees to the number of fare passengers carried during the year decreases with increasing population.

The next table shows the number of salaried employees and the number of wage-earners on the surface railways, including electric, animal and cable lines,* in the ten largest cities of the United States, together with the relation between these numbers and the traffic. It should be noted that, in some cases, the area and population of the cities as covered by this table do not correspond exactly with the area and population of the "urban centers," of which these cities are the chief part.

CLASSIFIED WAGES FOR ALL ELECTRIC SURFACE RAILWAYS

The next table shows for all wage-earners on electric surface railways, and for the leading classes separately, the number receiving stated rates of daily wages within 25-cent limits. It shows also the percentage which the number falling within each wage group bears to the total number of wage-earners of the class, together with cumulative percentages.

TABLE SHOWING DISTRIBUTION OF WAGE-EARNERS OF ALL ELECTRIC SURFACE RAILWAY COMPANIES ACCORDING TO DAILY WAGES RECEIVED: 1902

(Each cumulative percentage shows the proportion of the total number receiving a wage as great as, or greater than, the lowest rate of the given wage group.)

Rate per Day (Dollars).	All Classes.			Conductors.			Motormen.			Road and Track Men.		
	Number.	Percentage.		Number.	Percentage.		Number.	Percentage.		Number.	Percentage.	
		Of total.	Cumulative.		Of total.	Cumulative.		Of total.	Cumulative.		Of total.	Cumulative.
Less than 1.00	656	0.7	100.0	50	0.2	100.0	23	0.1	100.0	473	4.7	100.0
1.00 to 1.24	2,719	2.9	99.3	899	2.8	99.8	884	2.7	99.9	477	4.8	95.3
1.25 to 1.49	4,468	4.7	96.4	1,046	3.3	97.0	1,123	3.5	97.2	1,368	13.8	90.5
1.50 to 1.74	15,431	16.3	91.7	3,983	12.5	93.7	3,374	10.4	93.7	4,505	45.4	76.7
1.75 to 1.99	15,213	16.0	75.4	5,426	17.0	81.2	5,481	16.9	83.3	1,280	12.9	31.3
2.00 to 2.24	39,663	41.8	59.4	17,059	53.5	64.2	16,665	51.4	66.4	1,229	12.4	18.4
2.25 to 2.49	10,421	11.0	17.6	3,124	9.8	10.7	4,325	13.4	15.0	384	3.9	6.0
2.50 to 2.74	3,262	3.4	6.6	192	0.6	0.9	291	0.9	1.6	162	1.6	2.1
2.75 to 2.99	1,045	1.1	3.2	17	0.1	0.3	7	(*)	0.7	8	0.1	0.5
3.00 and over	1,996	2.1	2.1	73	0.2	0.2	239	0.7	0.7	40	0.4	0.4
Total	94,874	100.0	....	31,869	100.0	....	32,412	100.0	....	9,926	100.0	....

Rate per Day (Dollars).	Engineers.			Firemen.			Mechanics.			All Other Classes.		
	Number.	Percentage.		Number.	Percentage.		Number.	Percentage.		Number.	Percentage.	
		Of total.	Cumulative.		Of total.	Cumulative.		Of total.	Cumulative.		Of total.	Cumulative.
Less than 1.00	3	0.2	100.0	16	0.7	100.0	21	0.3	100.0	70	0.7	100.0
1.00 to 1.24	5	0.3	99.8	76	3.2	99.3	83	1.2	99.7	295	2.9	99.3
1.25 to 1.49	39	2.5	99.5	135	5.8	96.1	195	2.9	98.5	562	5.6	96.4
1.50 to 1.74	104	6.8	97.0	469	20.0	90.3	896	13.3	95.6	2,100	20.9	90.8
1.75 to 1.99	89	5.8	90.2	637	27.2	70.3	1,062	15.7	82.3	1,223	12.2	69.9
2.00 to 2.24	295	19.2	84.4	770	32.8	43.1	1,707	25.3	66.6	1,953	19.5	57.7
2.25 to 2.49	187	12.2	65.2	171	7.3	10.3	1,017	15.1	41.3	1,213	12.1	38.2
2.50 to 2.74	274	17.9	53.0	48	2.1	3.0	936	13.9	26.2	1,359	13.5	26.1
2.75 to 2.99	115	7.5	35.1	1	(*)	0.9	427	6.3	12.3	470	4.7	12.6
3.00 and over	423	27.6	27.6	21	0.9	0.9	409	6.0	6.0	791	7.9	7.9
Total	1,534	100.0	....	2,344	100.0	....	6,753	100.0	....	10,036	100.0	....

*Less than one-tenth of 1 per cent.

The statistics of classified wage-earners presented in this table are confined to electric surface railways (including those with and without commercial lighting), because the occupations for other classes of railways differ so much in character as to render comparison misleading. Even of the electric surface railway companies, fifty-four failed to report in full regarding classified wages of their employees and have been omitted from the classified figures. The most important of the omissions are the Chicago City Railway Company, the United Railways & Electric Company of Baltimore, the Boston Elevated Railway Company, the St. Louis Transit Company, the Cleveland Electric Railway Company, the Columbus Railway Company and the Union Railroad Company of Providence.

In the above table the heading "all other classes" includes foremen; inspectors; starters; watchmen; switchmen; hostlers, stablemen, etc.; linemen; dynamo and switchboard men; electricians and lamp trimmers.

The highest wages were found in Montana, where the median for all classes of wage-earners on electric surface railways was $3.50 to $3.54. The only other States in which the median for all wage-earners combined exceeded $2.10 per day are California, Colorado, Oregon and Rhode Island. In eleven of the States named in the table the median group for all employees was $2 to $2.04, and these States include several of the most important. The median for all wage-earners was below $1.50 in Alabama, Arkansas, Georgia, North Carolina and Tennessee.

The median rate of wages for conductors, which corresponded closely with that for motormen, was $2 to $2.04 in several of the leading States. Only in California, Colorado, Illinois, Michigan, Montana, Oregon and Rhode Island was the median above this figure. In five Southern States the median for conductors was below $1.50 per day. For road and track men several States have a median of $1.50 to $1.54. Of the States in which the wages of road and track men were comparatively high, the most important are California, Colorado, Massachusetts, Minnesota, Montana, New York, Oregon, Utah, Washington and Wisconsin. The median for this class of wage-earners was less than $1 per day in four Southern States, where negro labor is largely employed.

INTERURBAN RAILWAYS

Chapter VII. is devoted to "Interurban Railways; Their Economic, Financial and Social Features." In the introduction, the compilers refer to the difficulty already mentioned of classifying roads into urban and interurban, as many possess both kinds of line, and make no distinction in their returns between the two. As previously stated, the general rule followed in this respect has been to consider as interurban any railway which has more than one-half of its trackage outside the limits of incorporated municipalities; and to consider as a "fast, long" interurban any railway more than 15 miles in length, which

* The Brooklyn and Boston companies which operate elevated as well as surface tracks are included in the table.

has two-thirds or more of its trackage outside the limits of municipalities and which operates cars at a maximum speed of 20 miles or more per hour. On the basis of these rules, various companies have been classed as interurban the urban traffic of which might perhaps be found, if the information were at hand, to exceed somewhat their interurban traffic. The railways classed as "other" interurban railways are, however, much more heterogeneous in character than the "fast, long" interurbans, though even among the latter there are several which have a considerable amount of strictly urban traffic. For example, on account of its extensive urban traffic, the Detroit United Railway Company, which operates some of the most progressive interurban lines, has been classed necessarily with the miscellaneous group rather than with the group of typical fast interurban railways.

It would, of course, have been more instructive to have distinguished more specific classes among interurban railways. For instance, a distinction might be drawn between interurban lines proper and suburban lines, between companies which do a considerable proportion of their business within the limits of cities and those which do only a small proportion within such limits, and between lines which depend largely upon seasonal traffic and those which have traffic fairly well distributed throughout the year. The different railways grade into one another so imperceptibly in these respects, however, that, in the absence of more detailed information regarding the nature of the business of each company, such classification has been deemed impracticable, and it has been found necessary to group together all interurban railways except those of the special class of fast, long lines above defined.

The report then describes in a general way the different phases of development of interurban lines in different sections of the country, and presents certain maps from the Street Railway Journal of the lines in different States.

TRAFFIC AND EARNINGS OF INTERURBAN RAILWAYS

Under this title the table on the next page is given of statistics from fifty-three of the fast, long interurban lines that reported financial data. The companies with commercial lighting and those in operation only part of the census year are distinguished from the other companies. It should be noted that two or three companies of the larger group did not have all of their trackage in operation during the whole of the census year, but inasmuch as the companies themselves were in operation during the entire year, they have been included in the group of full-time lines. The table shows, per mile of track, the total operating earnings, earnings from strictly railway business (i. e., from passengers, chartered cars, freight, mail and express), passenger earnings, and combined freight, mail and express earnings, all of these ratios being based on the total trackage operated, including that under trackage rights. Earnings from the sale of current for light and power, or from miscellaneous sources, do not appear as a separate item, but are equal to the difference between the first column and the second. The table presents likewise the total railway earnings per mile run by cars of all classes and the total passenger earnings per passenger car-mile. It is impracticable to present the statistics of earnings from freight, mail and express business per mile operated by cars devoted exclusively to this business, because of the character of the reports on this point and because of the frequent practice of handling such traffic in passenger cars. Finally, the table indicates the total amount of operating expenses per car-mile for all classes of cars and the ratio of total operating expenses to total operating earnings.

Confining attention to full-time companies without commercial lighting plants, the average earnings from all sources per mile of track for all companies are $3,308, of which $3,032 is derived from passengers and $185 from freight, mail and express. Of the forty companies in this class nine earn less than $2,000 per mile of track. At least six of these, however, did not have all their trackage in operation throughout the whole census year. Nine companies earned from $2,000 to $3,000 per mile of track; eleven, the largest group, from $3,000 to $4,000; four from $4,000 to $5,000, and seven more than $5,000 per mile. While some of the companies with high earnings per mile of track derived a considerable part of their revenue from passengers carried within the limits of cities, others that earned $4,000 or more per mile derived much the greater part of their earnings from strictly interurban business.

Nearly all of the earnings of the first group of railways shown in the table are from strictly railway business. The five companies that operate lighting plants, the second group in the table, have a considerable revenue from that branch of the business, but their railway earnings proper are larger per mile of track than those of most of the companies without lighting plants. Two or three of the five companies do an important urban as well as interurban business. The earnings per mile of track of companies operating during only part of the year vary greatly because of the difference in the length of time that they were operated.

The freight, mail and express business of the interurban railways shows such widely differing stages of development that an average for all companies is not significant. Eight of the fifty-three companies shown in the table have earnings from these sources equal to more than one-tenth of their earnings from passengers, and of these eight companies three have freight, mail and express earnings equal to more than one-third of their revenue from passengers. All of the four companies in Michigan operating the entire year do an important freight and express business, and the same is true of the interurban lines of the Detroit United Railway Company, which is not included in the table. Among other companies whose freight and express business is important may be mentioned the Indianapolis & Eastern Railway Company, the Eastern Ohio Traction Company (Cleveland to Garrettsville, etc.), the Cleveland, Painesville & Eastern Railroad Company, the Dayton, Springfield & Urbana Electric Railway Company, the Toledo & Western Railway Company (Toledo to Adrian, Mich.), the Mahoning Valley Railway Company (Youngstown, Ohio, to Newcastle, Pa.), the Los Angeles Pacific Railroad Company, the Erie Traction Company (Erie to Cambridge Springs, Pa.), and the Albany & Hudson Railway & Power Company.

The ratio of earnings to car mileage on interurban railways is much more nearly uniform than the ratio of earnings to trackage. Moreover, this figure furnishes a basis for comparison of the financial operations of part-time and full-time roads which the ratio of earnings to trackage did not permit. The total railway earnings of the three groups of interurban companies in the table are equal to 20.6 cents per car-mile, and the passenger earnings are equal to 20.3 cents per car-mile. No great difference appears in these ratios as among the three groups of companies. Of the fifty-two companies for which care mileage was reported, six have railway earnings of less than 15 cents per car-mile, sixteen have earnings of from 15 cents to 20 cents, nineteen from 20 cents to 25 cents, ten from 25 cents to 30 cents, and one more than 40 cents per car-mile.

The operating expenses per car-mile for full-time interurban railways without commercial lighting average 12.4 cents, and those for companies operating only part of the year, most of which do not furnish commercial lighting, 13.7 cents. Some of the companies report remarkably low ratios of operating expenses, ten showing less than 10 cents per car-mile. Only nine of the full-time companies without commercial lighting have operating expenses exceeding 15 cents per car-mile, and several of these cases are easily explained by temporary or exceptional causes. The total operating expenses of companies which do an extensive lighting business are naturally relatively high per car-mile.

RELATION BETWEEN EARNINGS AND POPULATION SERVED

While a great deal of interest attaches to this relation, only rough approximations are possible. The greatest difficulty is found in determining the extent of the population which is to be considered as tributary to a given railway. Thus, where a railway connects a group of small towns with a large city, the population of the small towns usually furnishes much more traffic than that of the city, although the inhabitants of the city may greatly outnumber those of the smaller towns. The latter contributes some traffic, but it is obviously improper to combine the population of the large city with that of the small towns in calculating the per capita traffic. Where two large cities are connected by an electric railway, which also serves intermediate towns, the traffic furnished by the cities is likely to be somewhat greater than where only a single city is served. The amount of traffic will depend largely upon the distance between the two cities and the comparative speed and charges of the electric and steam service. But even where two cities are connected in this manner it would likewise be improper to count the population of the cities in the same way as that of the smaller towns in determining the relation of traffic to population. In other cases interurban railways connect only towns of medium or small size. There is ordinarily less to attract travel on such a railway, and the ratio between earnings and population served may be expected to be lower than the ratio in the case of railways connecting with large cities.

It is also quite impossible from the available statistics of population to determine the number of the inhabitants of rural communities who can be considered as tributary to an interurban railway. Ordinarily the township, which is the unit for reporting the population, is of such large area that only a small portion of its inhabitants have access to a railway running through it. In some cases, to be sure, interurban lines draw a considerable proportion of their traffic from the farming class. Usually, however, much the greater part of the traffic is furnished by the inhabitants of towns.

The small table below shows the relation between operating earnings and population for sixteen selected fast, long interurban railways. The population is that of the census of 1900, while the operating earnings are for the census year 1902. The population taken as a basis in each case includes only incorporated places, and does not include large cities serving as termini, which are for convenience designated as "city termini." Of the railways under consideration, eight are in Ohio, five in Michigan, and one each in Indiana, Illinois and Missouri.

The first ten railways referred to in the table all connect towns of small or medium size with a single large city. Dayton, Ohio, with a population of 85,333, is the smallest city terminus in the group. No. 1 serves eight towns of between 1000 and 20,000 inhabitants, with a total population of nearly 40,000. The largest town served has also another important interurban railway connection. No. 2 serves five small towns and one of

TABLE SHOWING GENERAL RESULTS OF OPERATION OF FIFTY-THREE FAST, LONG INTERURBAN RAILWAY COMPANIES: 1902

CLASS.	EARNINGS PER MILE OF TRACK. Total.	From railway operation proper. Total.	From passengers.	From freight, mail, and express	Railway earnings proper per car mile.	Passenger earnings per passenger car mile.	Operating expenses per car mile.	Per cent. age of operating expenses to operating earnings.
Full-time railways without commercial lighting:								
Average for all companies...	$3,308	$3,217	$3,032	$185	$0.201	$0.197	$0.124	59.9
Individual companies...	4,153	4,060	3,968	92	.159	.155	.069	42.4
	3,566	3,542	3,537	5	.165	.165	.095	57.2
	4,148	4,138	4,037	101	.205	.207	.125	61.2
	3,091	3,091	2,848	243	.237	.235	.146	61.7
	5,582	5,541	5,393	148	.203	.202	.147	72.1
	5,754	5,680	5,580	100	.220	.220	.119	53.5
	1,589	1,480	1,480	....	.084	.084	.092	103.1
	3,052	2,895	2,892	3	.182	.185	.133	69.3
	3,955	3,936	3,764	172	.189	.181	.094	49.5
	3,054	3,030	2,575	455	.223	.197	.125	55.7
	3,495	3,434	3,151	283	.197	.193	.098	48.5
	2,069	2,069	1,870	199	.166	.179	.121	73.2
	3,412	3,410	3,149	261	.235	.236	.179	76.3
	2,664	2,379	2,354	25	.193	.209	.137	63.5
	2,265	2,264	1,959	305	.273	.262	.202	74.0
	3,815	3,730	3,711	19	.202	.201	.176	85.0
	2,371	2,367	2,294	73	.242	.234	.127	52.3
	676	658	658	....	.144	.144	.127	85.5
	5,405	3,363	3,357	6	.113	.113	.109	60.0
	5,384	5,324	5,250	74	.192	.196	.100	51.7
	2,872	2,872	2,872	....	.180	.180	.080	44.4
	3,258	3,207	3,037	170	.207	.206	.120	56.9
	1,842	1,826	1,183	643	.267	.173	.181	66.9
	4,624	4,373	4,111	262	.243	.228	.144	56.0
	1,357	1,357	1,357	....	.403	.424	.268	66.5
	3,498	3,498	3,261	237	(*)	(*)	(*)	56.1
	2,275	2,265	2,152	113	.141	.142	.080	56.8
	1,743	1,743	1,697	46	.190	.185	.201	105.7
	3,799	3,754	3,677	77	.233	.229	.092	39.1
	1,383	1,358	892	466	.239	.208	.148	61.0
	2,409	2,351	2,199	152	.176	.174	.118	65.3
	2,854	2,827	2,814	13	.171	.199	.132	76.3
Full-time railways without commercial lighting—Continued.								
Average for all companies ..	$5,903	$5,815	$5,766	$49	$0.275	$0.275	$0.186	66.5
Individual companies ..	6,603	6,581	6,352	229	.249	.243	.127	51.3
	4,125	4,089	3,513	576	.289	.280	.138	47.4
	5,649	5,460	5,408	52	.208	.207	.121	56.4
	1,625	1,508	1,504	4	.133	.133	.168	116.7
	2,221	2,131	1,739	392	.280	.229	.198	68.1
	1,937	1,900	1,790	110	.238	.224	.145	60.0
	1,968	1,937	1,937	....	.120	.120	.091	74.7
Full-time railways with commercial lighting:								
Average for all companies ..	5,815	4,572	4,416	156	.206	.203	.153	58.4
Individual companies ..	6,060	5,176	5,142	34	.189	.188	.123	55.5
	4,752	3,673	2,778	895	.242	.201	.246	74.1
	9,900	6,828	6,753	75	.259	.261	.261	69.6
	5,463	4,689	4,581	108	.178	.180	.100	48.3
	3,827	2,692	2.681	11	.257	.256	.197	54.1
Part-time railways:								
Average for all companies ..	2,016	1,936	1,864	72	.212	.218	.137	61.9
Individual companies ..	4,032	3,881	3,838	43	.214	.217	.139	62.6
	2.084	2,024	1,989	35	.203	.199	.115	55.3
	1,207	1 204	1,157	47	.190	.210	.111	58.4
	914	912	902	10	.295	.292	.286	96.7
	1,931	1,921	1,757	164	.160	.161	.101	63.1
	935	735	735	....	.235	.235	.197	66.0
	1,257	1,204	1,204	....	.281	.281	.097	33.2
	2,731	2,557	2,365	192	.265	.245	.195	68.7

*Car mileage not reported.

TABLE SHOWING RELATION OF TRACKAGE AND OPERATING EARNINGS TO POPULATION SERVED IN THE CASE OF SELECTED FAST, LONG INTERURBAN RAILWAYS: 1902

NUMBER OF COMPANY.	Population of incorporated places, not including city termini, per mile of track operated.	Annual operating earnings per inhabitant served.	NUMBER OF COMPANY.	Population of incorporated places, not including city termini, per mile of track operated.	Annual operating earnings per inhabitant served.
1.	493	$6.61	9.	816	$4.29
2.	259	*11.80	10.	181	9.66
3.	558	6.39	11.	350	6.89
4.	278	14.20	12.	557	9.66
5.	494	†7.74	13.	1,009	3.98
6.	570	6.13	14.	1,618	3.49
7.	230	14.83	15.	2,044	2.89
8.	270	3.96	16.	696	1.73

*Freight earnings more than one-seventh of total. †Operates a lighting plant.

about 20,000 inhabitants, situated at one end of the line. The total population of these towns is between 30,000 and 40,000. No. 3 connects one large town and four towns of less than 3000 inhabitants each with a city, the total population of the five towns being about 35,000. No. 4 connects four small towns with a large city, the aggregate population of these towns being less than 8000. Presumably, a considerable amount of traffic is in this last case furnished by rural communities, while some may possibly come from beyond the terminus of the railway. No. 5 has as one of its termini a town of more than 15,000 people, and serves four intermediate places of smaller size, the total population of these five towns being between 25,000 and 30,000. No. 6 serves three towns of considerable size and five smaller towns, their combined population being more than 50,000. The town population directly served by No. 7 is very small, and it probably carries a considerable number of passengers to a connection with the steam railroad at its terminus. No. 8 connects three small towns with a large city. No. 9 serves one city of more than 30,000 people and two or three smaller towns, the total population served being more than 40,000; the larger town mentioned has also electric railway connections in other directions. No. 10 serves less than 10,000 people directly, these being mostly confined to the town at its terminus. Presumably, a considerable amount of traffic is due to steam railroad connections.

Nos. 11 and 12 each connect two large cities at considerable distances from each other. Probably, however, much the greater part of the traffic is furnished by the intermediate towns, which in the one case have an aggregate population of more than 40,000 and in the other case of more than 60,000.

Nos. 13, 14 and 15 do not reach large cities, but in each case have as their termini medium-sized towns with population ranging from 10,000 to 45,000. They are all lines of considerable length and serve two or more minor towns in addition to their termini. No. 16 connects four towns of between 5000 and 25,000 population, and also serves several smaller places. It will be observed that, as might be expected, the ratio of traffic to population is lower in the case of the last four railways than in most of the other cases. The "city terminus" has a strong tendency to attract travel on the part of the inhabitants of the neighboring smaller towns.

Most of the railways covered by the table are highly prosperous. More than half of them report a ratio of operation expenses to earnings below 60 per cent, and only three have a ratio exceeding 75 per cent.

EFFECT ON LOCAL BUSINESS AND ON PARALLEL STEAM RAILWAYS

The effect of an electric railway on the business of the merchants in the small towns traversed was made the subject of a special inquiry. The replies, though somewhat contradictory, were in the main that while more people than formerly go to the large towns to purchase certain classes of goods, the loss to the mechant is more than offset by the increased population of the town and by the increased patronage of the farmer classes. The effect on parallel steam roads is also one which does not follow any general rule.

The Northwestern Ohio Trolley League has been formed through the assistance of the Canton-Akron Traction Company and the Northern Ohio Traction & Light Company. The following towns on the lines of these railways will be represented by teams: Akron, Cuyahoga Falls, Kent, Barberton, Wadsworth, New Berlin and Canton. Regular scheduled games will be played.

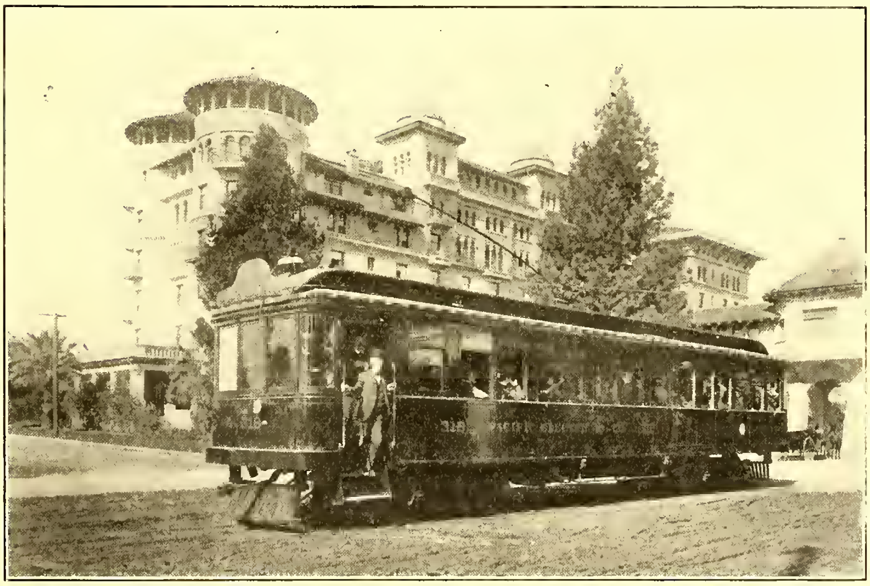
NEW OBSERVATION CARS BUILT IN LOS ANGELES

Two splendid observation cars have just been constructed by the Pacific Electric Railway Company in its extensive car shops at Los Angeles. They are of the 300 type, being 49 ft. 6 ins. long and weighing 65,000 lbs. They are equipped with

SEATING ARRANGEMENT OF LOS ANGELES OBSERVATION CAR

motors for 75 m.p.h., but have been known to attain a speed of 78 m.p.h. They seat fifty-four passengers, in cane-covered revolving chairs, and are provided with a perfect toilet equipment.

"The company has just finished these coaches for use as observation cars in our service, known as 'Seeing Orange Groves,'" said J. McMillan, traffic manager, to a representative of the STREET RAILWAY JOURNAL, "but we are now to build two more that shall be strictly parlor cars, with heavy draperies and the fanciest kind of carpeting and upholstering, fitted out in the most attractive manner. For this kind of coach the tourists present a call every winter that we cannot possibly supply. The new observation cars are equipped for striking illumination effects in the evening, by a row of incandescent lights around each car at the eaves. We feel very proud of the work we have done in constructing these cars in our own shops in Los Angeles."



HIGH-SPEED OBSERVATION CAR BUILT BY THE PACIFIC ELECTRIC RAILWAY COMPANY

RAPID TRANSIT PROPOSALS IN NEW YORK

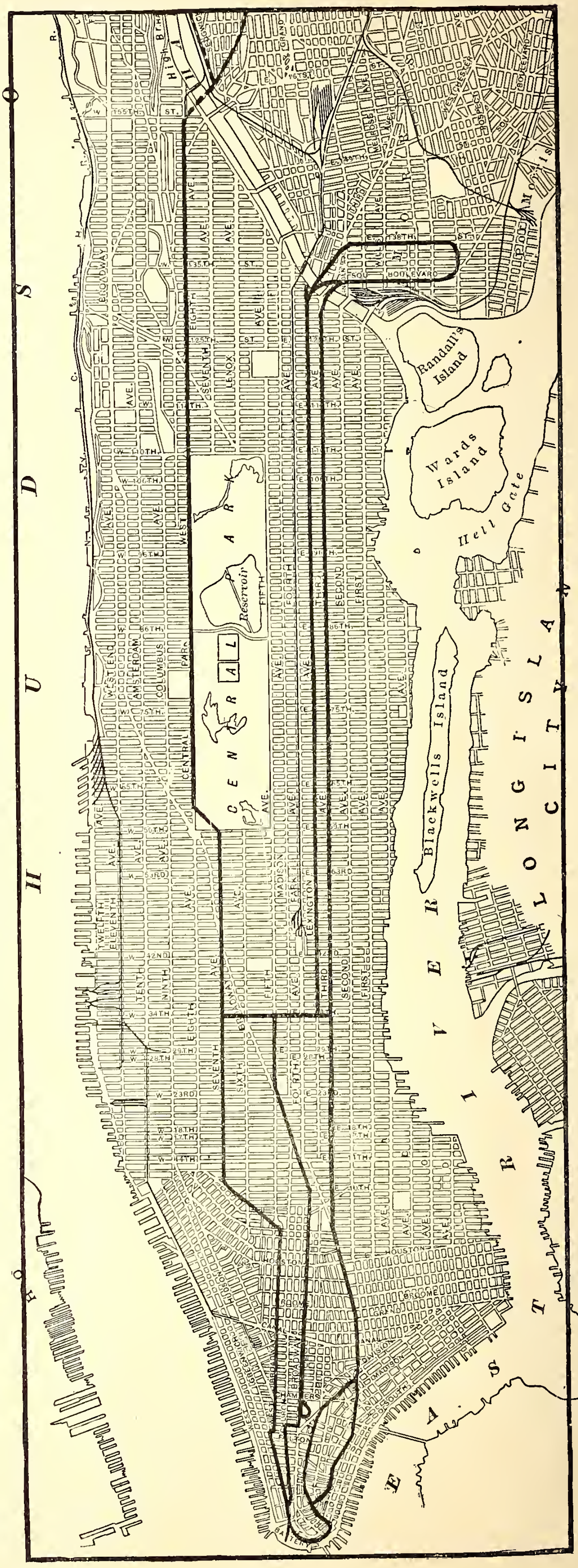
Proposals made to the New York Rapid Transit Commission last week by interests desirous of building new underground rapid transit lines in New York provide for a total expenditure of more than $200,000,000. The applicants for rights are the New York City Railway Company, operating the surface lines in Manhattan Borough, and the Interborough Rapid Transit Company, operating the elevated and the subway lines in that borough. Their applications are now formally before the board, and it is said that other bidders will soon make proposals, among them the New York & Port Chester Railway, which plans to build a four-track third-rail electric railway from New York to Port Chester, a distance of about 27 miles.

Neither the New York City Company nor the Interborough Company has applied for the right to build over the routes originally recommended to the Rapid Transit Commission. Each wants to build over a modified route that it thinks would best conserve its own interests. The accompanying maps show these routes. The recommendations to the commision by its engineers for new lines were only tentative, so that modifications can easily be made. From the maps it can be seen that it would not be practicable to accept both proposals and so put the companies into direct competition.

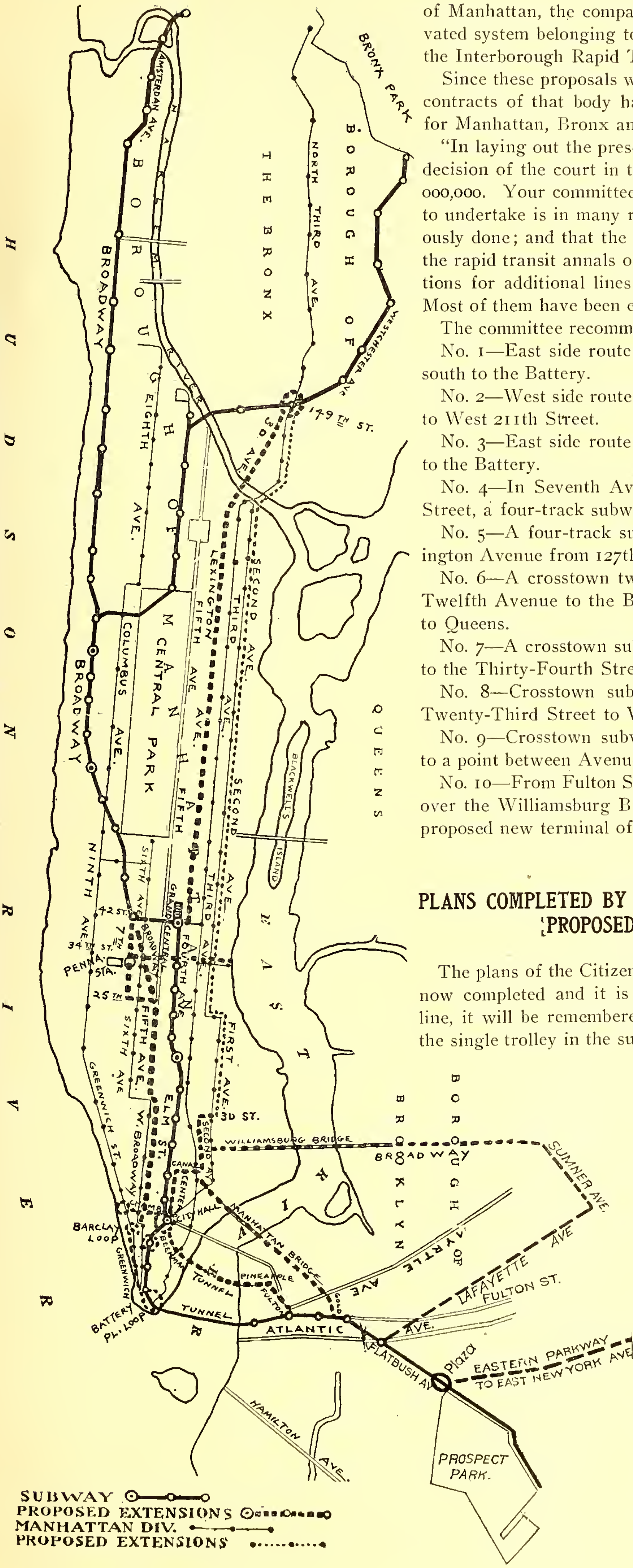
The New York City Company plans to build lines only in Manhattan. In short, the application of this company is for three new trunk lines, each with four tracks and a crosstown loop connecting the new Pennsylvania station with its proposed Third Avenue tunnel. Its proposal is fully shown in the accompanying map.

The Interborough Company's proposal, while in some instances it provides for lines to parallel those proposed by the New York City Railway Company, is in the main radically different from that company's plan. Routes are planned for both Manhattan and Brooklyn Boroughs. No new trunk lines are proposed for the former, however. All of the strictly new lines are to run across town. For Brooklyn there is planned a two-track line connecting with the loop under City Hall Park, Manhattan, and running thence under the East River to Fulton Street, Brooklyn, where it will connect with the tunnel now in course of construction, the latter to be of four tracks between Court Street and Atlantic Avenue. A line of two tracks will extend from Lafayette and Flatbush Avenues, through Lafayette Avenue to Sumner Avenue, and thence to Broadway, to the Brooklyn terminal of the Williamsburg Bridge, the bridge at its Manhattan terminal to connect with a subway in Delancey Street; thence to Chrystie Street, to Canal Street, to Centre Street, to William Street, where it would connect with the second tunnel running to Brooklyn, which would have its outlet at Pineapple Street, Brooklyn. There is also to be a line of two tracks from the junction at Fulton Street and Flatbush Avenue, under the extension of Flatbush Avenue to the Manhattan Bridge, with connections at the Manhattan end of the bridge with the Second Avenue and Third Avenue elevated lines. A line to extend from the tunnel now being built at Prospect Park Plaza, through Eastern Parkway, to East New York Avenue, also is projected. The Interborough Company thus is prepared to enter into a contract and construct, under the terms of the rapid transit act, the complete system, as originally conceived, and, in addition thereto, to make extensions to the boroughs of the Bronx and Brooklyn, completing a comprehensive system of the rapid transit lines that will carry passengers from the northern extremity of the borough of the Bronx, through the borough of Manhattan and to various points in the borough of Brooklyn, and give the inhabitants of these boroughs a continuous ride without change of cars for a single fare of 5 cents, without regard to distance, over both subways and elevated lines.

In addition to completing the subway system in the borough



SUBWAY SCHEME PROPOSED BY THE NEW YORK CITY RAILWAY COMPANY



SUBWAY SCHEME AND ELEVATED RAILWAY EXTENSIONS PROPOSED BY THE INTERBOROUGH RAPID TRANSIT COMPANY

of Manhattan, the company is also prepared to extend and enlarge the elevated system belonging to the Manhattan Railway Company, now leased by the Interborough Rapid Transit Company.

Since these proposals were made to the board, the committee on plans and contracts of that body has reported on routes and plans deemed advisable for Manhattan, Bronx and Brooklyn Boroughs. This report says:

"In laying out the present subway system the board was restricted by the decision of the court in the use of the city's credit to a sum less than $50,000,000. Your committee considers that the work which the board is about to undertake is in many respects even more important than the work previously done; and that the year 1905 may perhaps be of more real moment in the rapid transit annals of the city than the year 1900. A wealth of suggestions for additional lines has come from residents of all parts of the city. Most of them have been excellent, but all of them could not be adopted."

The committee recommended the following routes:

No. 1—East side route in First Avenue from the borough of the Bronx, south to the Battery.

No. 2—West side route in Ninth and Columbus Avenues from the Battery to West 211th Street.

No. 3—East side route in Third Avenue from the borough of the Bronx to the Battery.

No. 4—In Seventh Avenue, from Forty-Second Street to Twenty-Fifth Street, a four-track subway or a two-track subway.

No. 5—A four-track subway in the borough of Manhattan through Lexington Avenue from 127th Street to Forty-Second Street.

No. 6—A crosstown two-track subway through Fifty-Ninth Street from Twelfth Avenue to the Blackwell's Island Bridge, then crossing the bridge to Queens.

No. 7—A crosstown subway in Thirty-Fourth Street from Ninth Avenue to the Thirty-Fourth Street Ferry.

No. 8—Crosstown subway from East Twenty-Third Street Ferry on Twenty-Third Street to West Twenty-Third Street Ferry.

No. 9—Crosstown subway on Fourteenth Street from Eleventh Avenue to a point between Avenues B and C, to connect with tunnel to Brooklyn.

No. 10—From Fulton Street and Broadway, Brooklyn, through Broadway, over the Williamsburg Bridge to Delancey Street and Centre Street to the proposed new terminal of the Brooklyn Bridge.

PLANS COMPLETED BY THE CITIZENS' RAPID TRANSIT COMPANY FOR PROPOSED NEW ROAD IN RICHMOND, VA.

The plans of the Citizens' Rapid Transit Company, of Richmond, Va., are now completed and it is proposed to commence work immediately. This line, it will be remembered, is to employ the double trolley in the city and the single trolley in the suburbs, using a switch on the car to throw the connections over from a metallic to a ground return. Eight and one-half miles are to be built in the city and 20 miles in the suburbs. The road is being installed by Philadelphia and Baltimore capitalists. The chief engineer is George E. Moffat, formerly of the Conneaut & Erie Traction Company.

CAR SCHEDULES IN MEXICO CITY

Cars on the lines of the Mexico City Electric Railway are operated separately now, and not in trains, except between 12 o'clock noon and 1 p. m., which is "rush" hour. Heretofore there would be, say, a train of two cars, made up of a first and a second-class car, operated on a twenty-minute schedule. Now there is a car every ten minutes, operating alternately a first-class and then a second-class. Where cars are run in trains, however, they are made up either of two first-class or two second-class cars.

MARCH MEETING OF THE OHIO INTERURBAN RAILWAY ASSOCIATION

The March meeting of the Ohio Interurban Railway Association was held at the Gibson House, Cincinnati, March 23.

The members of the transportation committee of the Indiana Electric Railway Association met the transportation committee of the Ohio Association Wednesday evening and discussed the adoption of an interchangeable coupon book which should be good on lines in both States. No decision was reached. In view of their lower rates, the Indiana roads feel that they cannot afford to make better than a 10 per cent reduction in the sale of such a book, while the majority of the Ohio roads reported to their committee that they believed it would affect the sale of the Ohio book if the discount was made smaller than the present 16⅔ per cent reduction. The Indiana roads were urged to follow the example of a number of Ohio roads which have recently increased their rates, but the Indiana committee expressed the opinion that this would be impossible in a number of cases where steam road competition is severe and where franchise conditions bind them to certain rates. In Ohio thus far very little difficulty has been encountered by reason of these objections. Negotiations between the two associations have not been abandoned, and the Indiana Association will discuss the situation at its next meeting, and its committee will confer again with the Ohio committee at the Ohio meeting at Springfield, April 27. The advantages of co-operation are thoroughly appreciated, and there seems little doubt that some plan will be worked out for accomplishing the desired result.

The subject of handling mail was discussed at the morning session. Of late a number of Ohio roads have been making efforts to secure more extensive mail contracts, and the government has had inspectors over a number of the properties studying the conditions. It is felt that the present rates paid interurbans for hauling mail are not high enough, and a prominent member advised that the association take up the matter and if possible secure better rates.

F. W. Coen, of the Lake Shore Electric, explained that the greatest handicap to increasing this service at present was the fact that interurban lines were classed distinct from steam roads, and that the appropriation for all electric roads amounted to only $530,000. He said that this appropriation must first be increased.

The rates paid interurbans are 3 cents per car-mile per route for sack mail and ¾ cent per foot of car per car-mile where a portion of a car is given up for that purpose. A number of the roads stated they received 7½ cents per car-mile for part of a car. It was the general sentiment that the business at present rates was not very profitable, particularly as the government requires companies to deliver the sacks to the postoffice, where it is located within a certain distance of the track. In several instances it was reported that roads were obliged to hire men to take care of this work and that it cost from 25 per cent to 30 per cent, and some cases more, of the entire contract. Other roads stop their cars and have the motorman and conductor deliver the mail, which causes annoying delays. One manager complained that the amount of mail on his route had kept increasing until it was a hardship to take care of it, but despite the increase he received no more for the service. He had adopted the plan of keeping an accurate record of the mail from station to station, and stated that after he had secured statistics covering several months he proposed to strike for an increase, and he would have figures to back up his claims. He suggested that other roads take similar steps.

The greatest cause for complaint seemed to be the fact that wherever a road carries mail it is flooded with a lot of railway mail inspectors, rural mail inspectors, mail clerks, postoffice clerks and other officials who expect to ride free. Some of the roads have carried all of them without question; others have attempted to distinguish between those who had a right to ride and those who were simply imposing upon them, while others have adopted the plan requiring every one of them to pay; in some cases they have ejected men where they refused to pay. In only one or two instances had they ever heard from headquarters where men had been put off. One manager stated he had kept track of this class of free transportation for a time and found it amounted to more than he was getting out of his mail contract. He adopted the "pay or get off" policy and had never heard anything further from it. Another manager said he had never been imposed upon to any great extent, but the few inspectors that did ride refused to sign a release slip or give a conductor a receipt that he could turn in, although the rules of the company require that a conductor must have something to show for every passenger carried. One or two of the inspectors were inclined to be insolent, and the manager took up the matter with the department, but all the satisfaction he could get was that the matter had been "referred."

Mr. Spring, of the Dayton, Covington & Piqua, said that occasionally, when the Pennsylvania main line trains failed to make connection with another steam road at Covington, they flagged his cars and obliged the crew to carry in all the Dayton mail; in a number of instances it filled up half his car. They never knew when this would happen, so there was no one to keep track of the amount carried, and he had never received anything extra for the service because he had a contract to carry the local mail, usually one bag, between these points. He wanted to know how he could get redress, but no one could answer the question.

Mr. Clegg, of the Dayton & Troy, said he had a rosy dream of special mail cars starting at Cincinnati and running through to Toledo and Detroit. He said the connections to be completed this year would make this physically possible. He thought the electric lines could cover the distance in practically the same time as the steam lines, and with their frequent service and the fact that in a great many instances the cars pass the doors of postoffices, he thought the electric roads could take care of such business and handle it more satisfactorily and cheaper than the steam roads. They recently made a proposition to carry the mail between Dayton and Lima at rates lower than the parallel steam road was getting, and the government sent an inspector to investigate. He compared the schedules and found that the electric line was making practically the same time between terminals. It was found also that the electric cars were on time 40 per cent more times in a certain period than the steam trains. The electric line passes the door of every postoffice on the route, while hauls are necessary in every case to the steam station. The only objection to the scheme is the fact that on the steam road the run mentioned is part of a through run, where it would be necessary to run the cars even though the electric line was given the local business.

Mr. Bicknell, of the Lake Shore Electric, stated that the American Street Railway Association had a committee at work on this question, and the legislative committee of the Ohio Association was instructed to confer with this committee and see what could be done to secure more mail business for the electric lines.

M. S. Hopkins, of the Fidelity Construction Company, was to have presented a paper on "Spring Track Repairs," but he was unable to be present, so the question was taken up for general discussion. The removal of weeds was first discussed.

Mr. Winters, of the Dayton & Western, said he had tried a chemical for killing weeds, and it worked very satisfactorily, so far as the weeds were concerned. The only objection to it was that it killed about six cows that had pastured on his right of way and he had to pay for them.

Mr. Coen, of the Lake Shore Electric, said crude oil had been used with good results.

Mr. Spring, of the Dayton, Covington & Piqua, said crude oil used on track would get into the cars and smear the woodwork, besides spotting clothes. He said steam roads had abandoned the scheme to a large extent. On his road they mow weeds twice a year. He thought salt could be used to good advantage.

Mr. Alderman, formerly chief engineer of the Appleyard system, said that weeds add 5 per cent to 15 per cent to track maintenance. He used cinders for ballast to a large extent, and while the weeds would not grow in them, they did not make as satisfactory ballast as gravel. Sections are 15 miles to 18 miles long, and they employ two men and a boss in winter and four to five men and a boss in summer; he thought that this was not enough for a summer force. He thought an interurban road should spend about $350 per year per mile on track maintenance, including tie renewals. He avoids highway construction, not only because of the danger from high speed, but because of the difficulty of draining such track. He advocated heavy cuts and fills, with plenty of drainage on cuts.

Mr. Richey, of the Indiana Union Traction Company, said their sections averaged 7 miles to 8 miles, and they employ two men and a foreman in winter and three to five men and a foreman in summer to each section. The labor for track maintenance figures about $275 to $300 per year.

Mr. Sloat, of the Cincinnati, Dayton & Toledo, has sections 18 miles to 25 miles long, and employs seven to ten men per section in summer and two or three men in winter. Section men work nine hours at 15 cents, and foremen receive $1.75 per day. He does not believe in starting track work in the early spring. He waits until about the middle of April, when the frost is all out of the ground, and he believes he gets better results.

Mr. Spring, of the Dayton, Covington & Piqua, said they were resurfacing several miles of track this spring, and they put on a large force to get it out of the way quickly. They will put on about 500 yds. of gravel per mile.

Mr. Brown, of the Pittsburg, McKeesport & Connellsville, said that with them it was not a question of getting more material onto the tracks, but of keeping it off. Slips and slides from the Allegheny Mountains block their tracks frequently at this time of the year.

Mr. Clegg, of the Dayton & Troy, said they spent $20,000 in ballasting last year, and that they would complete the balance of 10 miles this year. They use a coarse gravel taken from a river bed, and they cannot get at it until after the spring freshets are over. They are lifting all their track 4 ins. to 8 ins., which gets rid of weeds and improves the life of ties. He made some cuts the width of his right of way, and adjoining land slid into the cut. The property owner was after him for damages. His attorney told him he was not liable in a case where it was in the country, and he requested some opinions.

The general opinion was that the railroad would be liable, whether the cut was in the country or in a municipality.

Mr. Spring told of an instance where he made a fill and it ran over onto a farmer's property, knocking down a fence and letting cows onto the track, resulting in the death of two of them. The railroad not only had to pay for the cows, but pay the farmer for the land. Mr. Richey said they made a practice of buying more property just as soon as a cut or a fill ran over the width of the right of way.

Mr. Merrill, of the Western Ohio, said that the majority of their sections were 10 miles long, and they employ one foreman and three men in summer. They pay section men 15 cents an hour and foremen $45 per month. They have a roadmaster at $65 per month. He compared one 16-mile section ballasted with crushed stone with a 12-mile section ballasted with gravel. On the former they have four men and a foreman, while on the latter it requires a foreman and six men to keep the track in the same comparative condition. He said that the first duty in spring was to get the ditches open and allow the water to run off as quickly as possible.

A committee was appointed to prepare a resolution deploring the death of J. O. Arnold, president of the Dayton & Germantown Traction Company, one of the charter members of the association and an active worker.

Each company in the interchange bureau was asked to pay an assessment of $10 to take care of expenses incident to the formation of the bureau. This is the first assessment that has been made, and the expenses are very small. The sale of interchangeable coupon books and interline tickets was reported to be very gratifying. Free checking of interline baggage has unquestionably had a tendency to increase through business.

Thursday afternoon the members visited the plant of the Bullock Electric Manufacturing Company in special cars furnished by W. Kesley Schoepf, of the Cincinnati Traction Company. F. W. Garrett and L. C. Marburg, of the Bullock railway department, and L. Lowenberg, of the publicity department, were in charge of the party. Much interest was displayed in some of the new work the company is doing. As is generally known, the company is now building commercially its own switchboard apparatus, electric motors and turbo-generators. Among the large machines under construction at this time are four 5500-kw turbo-generators for Brooklyn, two 1500-kw 25-cycle alternators for New Orleans, and two 500-kw railway generators for Mansfield. A 44-ft. pit lathe, said to be the largest tool of its kind in the world, attracted a great deal of attention, and the design of the buildings, size and equipment of the plant were favorably commented upon. Returning from the plant, a stop was made at the station of the Cincinnati Gas & Electric Company, where a 1500-kw Bullock generator is now in operation.

SHOP KINKS ON THE EAST ST. LOUIS & SUBURBAN

The East St. Louis & Suburban Railway Company's shops are equipped with the Murphy car-wheel grinder, designed to grind car wheels without removing them from the trucks. The master mechanic, Lee Massengale, believing that better results can be secured by removing the wheels from the trucks to grind them and revolving them at a slower speed, is using this grinder in that way. He revolves the wheels at a speed of 6 r. p. m. To do this he has fixed up a countershaft above the wheel grinder, from which a belt is run to a split pulley which is placed on the car axle. The wheels therefore, instead of revolving several hundred revolutions per minute as they would if operated by the motors under a car, revolve very slowly. Mr. Massengale believes this to give better results than grinding the wheels under the car with the car wheels revolving at high speed; in fact, enough better results to justify taking the wheels from under the car.

During the past season all the company's open cars not before so equipped have had eave troughs placed along the sides of the car over the running boards to prevent water from dripping off the roof on to the conductor or passengers when they are on the running board. These eave troughs are of galvanized iron, 3 ins. wide and 1¼ ins. deep, and are left open so that the water can run off at either end.

A summary of the reports of the street railways of New Jersey to the New Jersey State Board of Assessors for the year ending Dec. 31, 1904, shows a total mileage of 996.37; capital stock, $84,972,880; capital paid up, $82,574,871; funded debt, $74,577,218; other debts, $5,453,374; cost of railroad, including equipment and appurtenances, $166,331,763; expenditures for repairs, superintendence, management, etc., $6,694,209; gross receipts, $10,277,586; dividends paid, $692,010.

THE QUESTION BOX

In this issue are given two interesting answers on the subject of snow removal. Questions and answers relating to employees are commenced, and the last of the answers on the handling of express and freight are published. A few additional questions on brake-shoes are given on page 668, and to these, answers are particularly requested.

A.—GENERAL

A 41.—What is the best method of keeping records of deeds to real estate, rights of way, etc.?

First, file real estate deeds alphabetically. Second, have atlas showing rights of way in detail, numbering the rights of way consecutively, giving each right of way document a corresponding number and file by that number.

A. H. Rogers, Pres.,
Southwest Missouri Elec. Ry., Webb City, Mo.

They should be typewritten, bound in book form and properly indexed.

C. E. Palmer, Supt.,
Cincinnati, Dayton & Toledo Tract. Co.

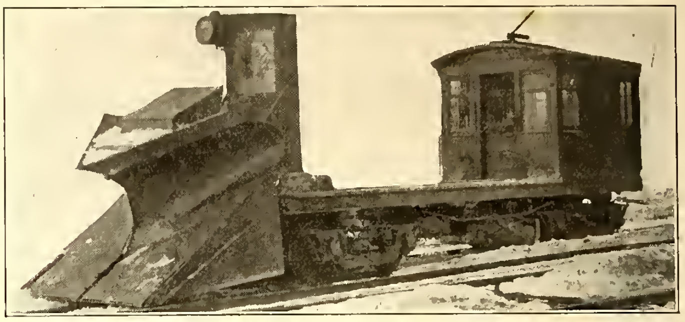
A 42.—Information is requested as to best ways of handling the snow-removing problem. Please describe in detail your snow-fighting methods and snow-fighting equipment. Please give all the steps taken from the time the first flurry of snow appears until the battle has been won and schedules restored.

First we keep in touch with the weather observer. We have snow plows on about one-third of our passenger cars which keep the snow thrown back through the day, and until 11 o'clock p. m. Except in very rare cases we have our heaviest snows during the night in this climate. If we have reason to believe a heavy fall of snow is coming, or if the night despatcher is so informed by "owl car" crews or night car house foremen, the superintendent is called by 'phone. He comes to his office, which is at central loop, and meets the roadmaster, who has also been called by despatcher. If they think it necessary, the superintendent calls the division superintendents and snow sweeper and plow crews, who each report to their respective division headquarters. The roadmaster calls out as many trackmen as he deems necessary. They are sent to such switches, crossings, etc., as the roadmaster may direct; the plows and sweepers being sent out by division superintendents as per instructions received from the superintendent. Each plow and sweeper goes over certain lines in accordance with schedules and plans laid out in the early fall. Crews report direct to despatcher at the ends of lines; the superintendent generally making despatcher's office his headquarters during the storm, thereby being able to give further instructions without delay. Unless we have a very strong wind we do not go over the lines but twice. If the snow falls fast all night with considerable wind, knowing all the worst places for drifting, we use our best judgment, sending men, plows and sweepers to such places as seem to need them the most. It would be almost impossible to give details in such cases, but we have managed for several years to have the first cars leave ends of lines on time the following morning. Our trainmen being required to report for duty ten minutes before the time for taking out their cars, we send the first cars out five minutes ahead of time from the car house, giving them time to trim up any switch that may need it, and enabling them to leave the end promptly on schedule time. We have never used any other than home-made snow plows.

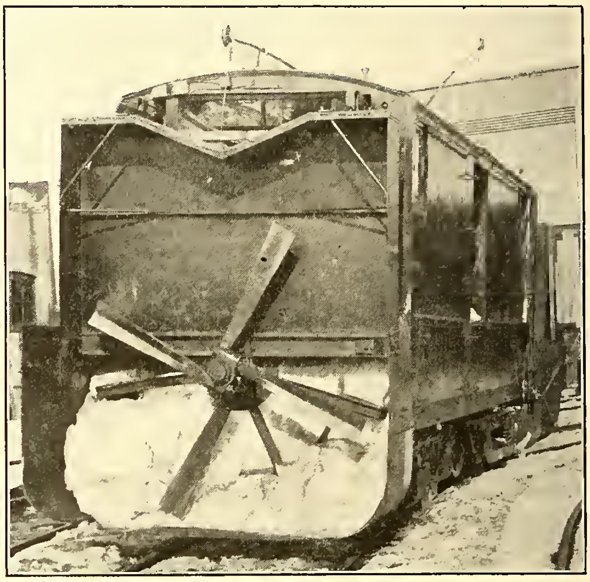
S. W. Cantril, Supt.,
Denver City Tramway Co.

Our snow-fighting equipment consists of two double-ended Ruggles rotary snow plows, each equipped with two GE 73 motors upon the fans, and four GE 73 motors on the trucks. We also have a square-nose plow mounted upon a flat-car, the trucks of which are equipped with four GE 73 motors. This plow is carried upon heavy timbers supported by the car platform and slides vertically in guides, the plow being supported by an air cylinder having a lift of 8 ins. The plow can be lowered within ½-in. of the rail and is left in this position when fighting snow. When a farm or highway crossing is approached, the plow is lifted by admitting air to the cylinder, and held 8 ins. above the rail until the crossing is passed, when the air is released from the cylinder and the plow drops to its working position. This is done to avoid catching the edge of the plow in the planks at crossings. With this equipment, and by "keeping eternally at it," we have been able to keep all trains on schedule time during the past winter. The road operates between Rochester and Geneva, a distance of 45 miles, and twenty trains are run each way each day on a schedule of 25 miles per hour, including stops. In addition, limited trains are run on a schedule of 40 miles per hour outside of corporate limits, including stops, and there are two baggage and freight trains each day.

F. W. Walker, Eng.,
Rochester & Eastern Rapid Ry. Co.



HOME-MADE SQUARE-NOSE PLOW, ROCHESTER & EASTERN



DOUBLE-END RUGGLES PLOW, ROCHESTER & EASTERN

SNOW-FIGHTING EQUIPMENT OF THE ROCHESTER & EASTERN RAPID RAILWAY

B.—EMPLOYEES

B 1.—What are the requirements demanded of applicants for conductors and motormen on your road? The editor will appreciate receiving copies of all the blanks used in your employment department.

Trainmen on the lines of this road are required to have good habits, good recommendations and to pass a medical examination to determine the condition of eyesight and hearing. The application blank used by this company is in the form of a contract or agreement, and the applicant is required to make affidavit to the truth of the statements, and to his willingness to abide by the conditions of the agreement. In addition to the usual questions relating to age, residence, previous employment and references, the application includes the following clauses:

I agree to submit to a medical examination by the company's doctor and pay $1.00 for same.

I agree to turn in a full and truthful statement of all accidents of which I may have knowledge.

I agree that in case of my failure to return any of the property intrusted to me, the value of same can be taken from my wages.

I agree to work under instruction on trial, without pay, at least ten days, and such additional time in excess thereof as the company may deem necessary.

I agree, as a punishment, in case of an infraction of the company's rules, to serve time practicing or under suspension without pay.

I understand that no compensation is paid to trainmen for time spent while engaged "on watch" (meaning waiting at any designated point for opportunity to work), but that wages are allowed only for service rendered while actually employed on the company's cars, computed at following rates. (Here follow rates of wages paid by the company to trainmen.)

These wages are satisfactory to me, and if employed, I agree to work contentedly and faithfully.

I further agree that if I am discharged, or leave the company's service voluntarily at any time during or after the trial period above referred to, I shall have no claim against the company for service rendered, or expenses incurred by me during said trial period, or while performing duty "on watch," as above explained.

I agree to at once provide myself with a standard uniform in accordance with the rules and regulations of the company.

While in the company's service, I agree to study carefully and comply faithfully with all its rules, regulations and orders.

On the back of the application blank is printed an extract from the Penal Code of the State of New York, relating to the punishment for obtaining employment under false statement or pretensions.

E. J. Ryon, Supt.,
Schenectady Ry. Co.

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Applicants for the position of conductor or motorman on the Syracuse Rapid Transit Railway must be between 21 and 40 years of age, not less than 5 ft. 6 ins. in height; conductors to weigh not less than 140 lbs.; motormen not less than 155 lbs.; have good hearing, hardened lungs, good eyesight without the use of glasses, and not crippled in hands, arms or feet; must be possessed of a fair common school education, be able to read intelligently, sign their name and make figures legibly, not addicted to the use of liquors, and must pass a rigid physical examination to show that they conform to the requirements.

J. E. Duffy, Supt.,
Syracuse Rapid Transit Ry. Co.

———

Motormen must be above average height, and must weigh about 175 lbs. Experienced men are accepted up to 35 years of age; inexperienced men not if more than 27. Conductors preferred not above average height; weight not in excess of 160 lbs. Age requirements the same as for motormen. Both must be of good address and of unquestioned moral character. Service record from last employer indispensable.

J. R. Harrigan, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

———

Age limit between 25 and 40, satisfactory physical examination, and good habits.

Jno. J. Akin, Supt.,
Los Angeles Ry. Co.

———

They must be capable men; must have a good past record and have had at least one year's experience at the business.

C. E. Palmer, Supt.,
Cincinnati, Dayton & Toledo Tract. Co.

———

We require applicants for positions in the transportation department to refer to or have letter of recommendation from past employers. They must also be endorsed by one responsible citizen. Applicants are required to file letter of application in own hand writing. If selected, they fill out and sign regular application blank.

Southern Superintendent.

———

We require satisfactory answers to questions asked on application blank.

J. Chas. Ross, Gen. Mgr.,
Steubenville (Ohio) Tract. & Lt. Co.

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The application blank used by the Steubenville Traction & Light Company, referred to in the foregoing answer, embodies several new ideas. The blank is intended to be in the nature of an agreement between the man and the company, and to this end clauses are inserted explaining various details about which disputes might afterward arise. As the applicant is required to assent in writing to each clause, there is left no chance later on for the excuse "I did not know that," or "I did not understand." The blank form contains all the usual questions in reference to age, residence, previous employment, physical condition, condition of eyesight, hearing, etc. The following questions then appear:

Have you ever been discharged or suspended from any situation? If so, state particulars, when and where, and for what reason?

Do you use intoxicating liquors or beers? To what extent, if any?

Do you play cards, pool or dice?. To what extent?

Do you make bets or wagers of any kind, or do you gamble in any way; if so, to what extent?

Do you know that while training for proposed position, you will receive no compensation?

Do you know that, if employed, you will be placed on the "Extra List" for 60 days, and will only be employed in your turn, when "regulars" or "reliefs" are off duty?

Do you know that you will only receive pay for hours actually spent on cars?

After the list of questions are printed the following clauses:

If given employment, I agree to obey the rules of the company, and the orders of the officers of the company; to abstain from the use of intoxicants; to accept such work as may be assigned to me and to discharge the duties of my position to the best of my ability.

I further agree that, if given employment, I will, in accordance with the rules, furnish myself with the uniform prescribed by the company, and that when I leave its employ, or am discharged, I will return all badges or other property of the company in my possession.

I do hereby recognize and agree that all of the employees of the Steubenville Traction & Light Company, excepting the general manager and superintendents, and other officials, are my fellow servants, and that it is my duty, as well as that of others to do everything to protect the patrons of said company and each other of said employees against injury or death from the operation of the cars, and maintenance of the road, wires and other parts of the property of said company. This agreement and recognition of co-laborers applies whether I am on duty or riding as a free passenger, or training for a proposed position as conductor or motorman; whether under pay at the time, or as a volunteer.

I agree to accept the proportion of payment when volunteering my services, that I would receive for the same time if on regular duty, and I shall report the time of any such service to the proper officials.

I do hereby agree, as a condition of my employment, to observe strictly all the rules and regulations of the Steubenville Traction & Light Company, contained in "Rule Book" now in force, or that may be issued hereafter from time to time, for the government of its employees, and acknowledge the right of said Steubenville Traction & Light Company or its officers to terminate my employment at any time without notice, and do agree that my wages shall cease at the time of such discharge, and do also agree not to consider myself an accepted trainman until I have worked sixty (60) days as an "extra" or get a regular run, and I certify that I have truly answered the foregoing questions, in my own handwriting, and I voluntarily subscribe to the statements made and the agreements herein contained.

After the man's application has been accepted he is given a rule book and is required to sign the following receipt: "I acknowledge having been furnished with a copy of the instructions to the conductors and motormen of the Steubenville Traction & Light Company, and of having read and informed myself of the rules of said company governing its employees."

Editors.

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To be eligible for a position as conductor or motorman on the Denver City Tramway the applicant must be under 35 years old, not less than 5 ft. 6 ins. in height and must weigh at least 150 lbs. Since adopting this rule we have been well satisfied with the results. Before giving employment reference blanks are sent out and the man's past record is fully scrutinized.

S. W. Cantril, Supt.,
Denver City Tramway Co.

B 2.—How are the men employed on your road? Do you have an employment bureau, or are applicants examined and hired by the manager or superintendent? Under what conditions does it become advisable to establish a separate employment department?

We have no employment bureau. Applicants between the ages of twenty-one and forty-five, who are recommended by some well known or responsible party, are hired by the superintendent. The applicant must, however, pass the physical examination and fill out an application blank in his own handwriting before he is put to work.
C. LOOMIS ALLEN, Gen. Mgr.,
Utica & Mohawk Valley Ry. Co.

In our case the men are hired by the superintendent. I should say that, where the road is sufficiently large to establish an employment bureau, the branch of the business could be put under a separate head.
E. J. RYON, Supt., Schenectady Ry. Co.

On this road all applicants are examined and hired by the superintendent. On systems in large cities, say of 250,000 and over, I think it advisable to have a separate employment department.
J. E. DUFFY, Supt., Syracuse Rapid Transit Ry. Co.

Our men are employed by the superintendent.
J. R. HARRIGAN, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

The assistant superintendent interviews all applicants before taking their applications, and after applications are received he has blanks sent out to the references. He also looks after keeping the proper number of men on extra list, and when more men are required he sends for five or ten of the men on the waiting list. Upon reporting, the new men are first seen by the superintendent, who looks over their applications, sizes up the men, declining any he may think not satisfactory, and addresses them in regard to a few of the most important rules for motormen and conductors, as the case may be.
JNO. J. AKIN, Supt., Los Angeles Ry. Co.

Applicants are examined and employed by the superintendent.
C. E. PALMER, Supt.
Cincinnati, Dayton & Toledo Tract. Co.

Applicants are examined and hired by the superintendent of transportation, and all discharges are made by his approval.
SOUTHERN SUPERINTENDENT.

All car service men on this road are employed personally by the superintendent of transportation.
J. W. BROWN, Supt. Trans.,
Pittsburg, McKeesport & Connellsville Ry. Co.

Conductors and motormen are employed by the superintendent. While the necessity of establishing an employment bureau has not arisen in Denver, we presume that such an office would become desirable as soon as the duties of employing men required the entire time of one or more persons.
S. W. CANTRIL, Supt.,
Denver City Tramway Co.

B 3.—For conductors and motormen do you prefer married or single men and country bred or city men? Please give your reasons for your answer.

Married men, as I believe they are more steady and less taken up with the ladies to whom the uniform with the brass buttons is a great temptation.
C. LOOMIS ALLEN, Gen. Mgr.,
Utica & Mohawk Valley Ry. Co.

We prefer married men and country bred. Married men, as a rule, have their families to look after and are steadier. Country bred men, not having been brought up under the evil influences which are to be found in every city, are, as a rule, of better habits than the city man, and better appreciate a good position.
E. J. RYON, Supt., Schenectady Ry. Co.

For conductors and motormen I prefer married men, as they are more liable to desire steady employment, and, as their responsibility is greater, they obey the rules better than some single men. As to the difference between country bred and city men, they both have their bad and good qualities.
J. E. DUFFY, Supt., Syracuse Rapid Transit Ry. Co.

Other conditions being equal, we prefer married men. They have proved more reliable. City bred men are more apt. Those from the country have generally had less trouble with their reports.
J. R. HARRIGAN, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

We prefer married men, although difficult to get. Prefer country bred men with some city experience, as they usually have better constitutions, owing to habits of life, and they know the value of a dollar better, as they are brought up with the idea of work instead of play.
JNO. J. AKIN, Supt., Los Angeles Ry. Co.

Married men, because they are more steady workers. A country man seems to be better satisfied and more content to follow out the routine.
C. E. PALMER, Supt.
Cincinnati, Dayton & Toledo Tract. Co.

We prefer married men, as we find they report for duty more regularly and have better habits. We also find that country bred men appreciate their positions and are better satisfied with the work, as a rule, than city men.
SOUTHERN SUPERINTENDENT.

We prefer young married men, city bred, as being more reliable.
J. CHAS. ROSS, Gen. Mgr.,
Steubenville (Ohio) Tract. & Lt. Co.

We prefer young married men. A married man feels the responsibility of his position more than the young man with no one depending upon him for support, and will accept discipline in better spirit than the unmarried man. Country men are preferable, because their habits, as a rule, are more regular. They have more pride in holding their position; they do not "know it all," and they are anxious to learn. Men bred in the country give little trouble from drinking, and show up more regularly at 4:40 a. m. than the town men.
J. W. BROWN, Supt. Trans.,
Pittsburg, McKeesport & Connellsville Ry. Co.

We prefer married men who are country bred. We find that the best men are those to whom a position as conductor or motorman comes as a rise on the ladder, rather than as a "come down," and our experience has proven that this class of men, as a rule, are steady in their habits.
S. W. CANTRIL, Supt.,
Denver City Tramway Co.

B 4.—Do you employ men who have had previous experience on other electric roads? Why?

Yes, if the reference of the previous employer is found to be all right.
C. LOOMIS ALLEN, Gen. Mgr.,
Utica & Mohawk Valley Ry. Co.

We do not, as a rule, employ experienced men from other roads, preferring to train our men in our own methods. Men from other roads acquire habits not in conformity with our ideas and it is difficult to get them out of a rut. The best men which we have to-day on our road came from the country.
E. J. RYON, Supt., Schenectady Ry. Co.

We sometimes employ men who have had previous experience on other electric roads after we have satisfied ourselves that their records with the other roads have been satisfactory. We cannot see why this is not good practice, and especially so in the case of applicants for the position of motorman.
J. E. DUFFY, Supt., Syracuse Rapid Transit Ry. Co.

Yes, if their record where previously employed has been satisfactory. If the man is intelligent his experience is valuable.
J. R. HARRIGAN, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

We prefer experienced men, providing they have first-class records on other roads with no union tendencies. We seldom employ experienced men from union roads.
JNO. J. AKIN, Supt.
Los Angeles Ry. Co.

If their previous record is good we do, because experienced men are generally more easily broken in.
C. E. PALMER, Supt.
Cincinnati, Dayton & Toledo Tract. Co.

We employ experienced men only when they have located permanently in one of the cities on our system, and investigation shows the applicant to have a good record with the road he left.

SOUTHERN SUPERINTENDENT.

Occasionally, when they have good records.

J. CHAS. ROSS, Gen. Mgr., Steubenville (Ohio) Tract. & Lt. Co.

We seldom employ men from other roads. As a rule they do not make as good men as those trained from raw recruits.

J. W. BROWN, Supt. Trans., Pittsburg, McKeesport & Connellsville Ry. Co.

We sometimes employ experienced men if their recommendations are all right, and they meet the physical requirements.

S. W. CANTRIL, Supt., Denver City Tramway Co.

B 5.—What process do you go through after an application has been filed in determining whether the applicant has told the truth?

Send out letters in the shape of a special form to the parties given as reference, asking for confirmation of the applicant's statements.

C. LOOMIS ALLEN, Gen Mgr., Utica & Mohawk Valley Ry. Co.

We require applicants for positions to give us references, also to furnish us with the names of employers during the five years previous, to whom we write for information as to the applicant.

E. J. RYON, Supt., Schenectady Ry. Co.

All applicants are expected to furnish at least two references from reputable business men and also give the names of their employers for the past five years. If we have any reason to doubt the truth of their statement, we have a blank form that we send out with questions which will determine the truth of the applicant's statement.

J. E. DUFFY, Supt., Syracuse Rapid Transit Ry. Co.

Apply to his last employer for service record. These records are exchanged by most roads.

J. R. HARRIGAN, Gen. Mgr., C. B. L. & N. and C. N. & Z. Columbus, Ohio.

We rely on statements from references.

JNO. J. AKIN, Supt., Los Angeles Ry. Co.

Send printed questions to his last employers and his references.

C. E. PALMER, Supt., Cincinnati, Dayton & Toledo Tract. Co.

We depend to a large extent on applicants' endorsements, but frequently have an inspector investigate and report if there appears to be questions about the correctness of statements made.

SOUTHERN SUPERINTENDENT.

Write or interview his references and former employers.

J. CHAS. ROSS, Gen. Mgr., Steubenville (Ohio) Tract. & Lt. Co.

We send a specially prepared blank form to all the names given as references on the man's application. We ask the following questions of each reference: How long have you known the applicant? Has he ever been employed by you? If so, how long? Why did he leave? From the knowledge you have of his habits and character would you be satisfied to employ him in a similar position? In the blank form we point out that it is very important to us that we secure the services of competent men, and we treat all information given as confidential.

J. W. BROWN, Supt. Trans., Pittsburg, McKeesport & Connellsville Ry. Co.

We examine his past record carefully, and also adopt other means that may be suggested when the individual case comes up.

S. W. CANTRIL, Supt., Denver City Tramway Co.

B 6.—Do you consider it a good idea to make applicants swear to the statements in their application blanks? Why?

We do not, as we think it would be very easy for a man to get around this sworn statement if he wished to do so, and it would be about as hard to prove that he had sworn falsely as it would to prove that a man, who had been drinking, was drunk.

C. LOOMIS ALLEN, Gen. Mgr., Utica & Mohawk Valley Ry. Co.

We require applicants to swear to the statements in their application blanks for the reason that we think the majority of men consider an affidavit, in a degree at least, sacred.

E. J. RYON, Supt., Schenectady Ry. Co.

No. We think it unwise to begin by doubting the truth of the applicant's statement.

J. R. HARRIGAN, Gen. Mgr., C. B. L. & N. and C. N. & Z., Columbus, Ohio.

We require no oath.

JNO. J. AKIN, Supt., Los Angeles Ry. Co.

I do not. It would be humiliating to an honest man, and no protection from a dishonest man.

SOUTHERN SUPERINTENDENT.

Have never required sworn statements.

J. CHAS. ROSS, Gen. Mgr., Steubenville (Ohio) Tract. & Lt. Co.

No, we do not see any advantage in requiring an applicant to swear to his statements. If we could not rely upon his word, we should not respect his oath.

S. W. CANTRIL, Supt., Denver City Tramway Co.

B 7.—Do you bond motormen or conductors? What is the process?

Our motormen and conductors are required to give bond in the sum of $500 through a surety company, and they pay the annual charge to the surety company.

JNO. J. AKIN, Supt., Los Angeles Ry. Co.

We do not bond either conductors or motormen, but require them to put up a security deposit. Some years ago we tried the bonding method. It cost each man $5.00 per year and caused some dissatisfaction among them. We consider it a needless expense to them.

S. W. CANTRIL, Supt., Denver City Tramway Co.

Six companies, namely, the Utica & Mohawk Valley Railway Company, the Schenectady Railway Company, the Columbus, Buckeye Lake & Newark Traction Company, the Columbus, Newark & Zanesville Electric Railway Company, the Steubenville (Ohio) Traction & Light Company, and the Pittsburg, McKeesport & Connellsville Railway Company report they do not bond either motormen or conductors.

EDITORS.

D.—THE EXPRESS AND FREIGHT QUESTION

D 28.—What is the best form of way bill to use?

I think the carbon tissue copy way bill made out with indelible pencil, the tissue copy remaining in the book, is preferable. This allows the receipt and shipment of goods up to within a very few minutes before the express car is due to leave. When the loading has been completed it is only necessary to close the way bill. The use of copying ink requires from ten to fifteen minutes to obtain the desired results.

A. EASTMAN.

Same as used by steam roads.

J. R. HARRIGAN, Gen. Mgr., Columbus, Buckeye Lake & Newark Tract. Co.

This is all a matter of opinion; an express man would commonly suggest an express form of way bill, while a freight man would naturally use a way bill of freight design.

E. J. RYON, Supt., Schenectady Ry. Co.

Way bills made up in book form so that a carbon copy and tissue can be taken.

GEORGE DUNFORD, Gen. Ex. Agt., Utica & Mohawk Valley Ry. Co.

D 29.—How do you handle your unclaimed express or freight?

Make every effort to deliver unclaimed goods or return to shippers. If no claimant can be found, sell according to law. Over, short and damaged matters are traced, retraced, and thoroughly investigated, and the obligation of the carrier met, whatever that may be.

GEO. W. PARKER, G. E. & P. A., Detroit United Ry.

Unclaimed express or freight matter is recorded in an "on-hand" book designed for this express purpose, and all unclaimed goods are sold at public auction according to law.

E. J. RYON, Supt., Schenectady Ry. Co.

Unclaimed freight and express known to be perishable is sold at once to the best advantage. Non-perishable matter is held for one year and sold at public auction. GEORGE DUNFORD, Gen. Ex. Agt., Utica & Mohawk Valley Ry. Co.

D 30.—What per cent of your gross receipts from express and freight do you pay out in settlement of loss and damage claims?

Less than one-half of one per cent.
J. R. HARRIGAN, Gen. Mgr., Columbus, Buckeye Lake & Newark Tract. Co.

Our percentage of loss and damage for the year ending June 30, 1904, was .0022. E. J. RYON, Supt., Schenectady Ry. Co.

About one per cent. J. W. GIBNEY, Supt. Ex. Dept., United Tract. Co., Albany.

D 31.—What have you done to reduce amount of loss and damaged shipments?

All that our limited intelligence and abundant energy would enable us to do. GEO. W. PARKER, G. E. & P. A., Detroit United Ry.

See that employees handling freight use good judgment and care, and obey rules governing transporting and transferring of freight at all times. The claim department is an important one, and should be in the hands of one who is familiar with the details of the business. J. R. HARRIGAN, Gen. Mgr., Columbus, Buckeye Lake & Newark Tract. Co.

A reduction in the amount of loss and damage can only be accomplished by insisting on the proper packing of goods and a perfect system of checking en route, and at transfer points and at destination. E. J. RYON, Supt., Schenectady Ry. Co.

By constantly warning employees to check shipments received, handle goods carefully, and secure receipts for all goods delivered. GEORGE DUNFORD, Gen. Ex. Agt., Utica & Mohawk Valley Ry. Co.

Instituted a system of careful checking in receipts and deliveries. We now check all goods from the wagon into the cars on the way bill, and a carbon copy of the way bill accompanies the car, and goods are checked out from the car on this way bill. This system has practically abolished all loss and damage claims.
J. W. GIBNEY, Supt. Ex. Dept., United Tract. Co., Albany.

D 32.—Is it advisable to handle express matter on combination passenger and express cars? Why?

No. Our passengers are too democratic on the one hand and too monarchical on the other to be mixed in with freight. Experience demonstrates that much loss, damage to goods, loss of time in transmission and general interference with passenger schedules result if the two services are handled together. Handle passengers in a passenger car, combining all reasonable comforts and conveniences. Handle express matter in an express car designed for the business, and properly heated.
GEO. W. PARKER, G. E. & P. A., Detroit United Ry.

Depends on the road and how operated. Ordinarily no. To conduct a passenger and freight business on same car is usually disastrous to both, especially to the passenger business. The two departments should not be operated together.
J. R. HARRIGAN, Gen. Mgr., Columbus, Buckeye Lake & Newark Tract. Co.

Have had no experience in handling express on combination cars, but see no objection to it. The volume of our business is such that it would be impossible for us to handle it in a combination car. E. J. RYON, Supt., Schenectady Ry Co.

I think the best method is to handle express in combination express and passenger cars, unless the tonnage is heavy enough to justify a train daily for this purpose. This method saves car mileage and extra cost for services of train crews, permits the making of quick deliveries and gives loads at times when passenger traffic is light, with a minimum increase in cost for power. It also provides for carrying baggage, and a road must carry baggage if there is competition. SOUTHERN SUPERINTENDENT.

D 33.—What is the best form of combination car for handling passengers and express matter? Please give description with photograph or sketch.

D 34.—Do you have your own warehouse at each station, or make other arrangements?

We have warehouses where the business warrants. At other places we arrange with storekeepers, and at still others platforms are provided where the goods are shipped at the risk of the owner.
GEO. W. PARKER, G. E. & P. A., Detroit United Ry.

Own freight room at Newark terminal. Have joint agent at Columbus and Zanesville. J. R. HARRIGAN, Gen. Mgr., Columbus, Buckeye Lake & Newark Tract. Co.

We own our warehouses at two of our terminal stations and rent a warehouse at another. In my opinion an electric road going into the freight business should provide the same facilities for the handling of freight that steam roads do. Without proper facilities the business cannot be made successful.
E. J. RYON, Supt., Schenectady Ry. Co.

At some stations we own our warehouses, and at others they are rented. GEORGE DUNFORD, Gen. Ex. Agt., Utica & Mohawk Valley Ry. Co.

D 35.—Please give suggestions as to best arrangement for terminals in which to handle express and freight.

Control terminals or have arrangements whereby authority is equal. If possible, have car enter freight shed, or along side of freight house. J. R. HARRIGAN, Gen. Mgr., Columbus, Buckeye Lake & Newark Tract. Co.

The usual plan for a steam road freight house is just such as is needed by electric railways. The buildings should be arranged so that the cars may be loaded and unloaded from one side and truckmen load and unload their wagons from the other side so there will be no interference or delays in getting business in and out of the house. E. J. RYON, Supt., Schenectady Ry. Co.

CORRECTION FOR TRACK DEPARTMENT

In the answer to question No. I 20, from W. H. Glenn, superintendent of roadways, Georgia Railway & Electric Company, published in the issue for March 25, an error was made in quoting Mr. Glenn as saying that the cost of sap pine ties, including creosoting, is 20 cents delivered, The statement should have been the cost of sap pine ties, for creosoting, is 20 cents. This price represents the cost of the tie itself ready for creosoting, but does not include the cost of doing the creosoting. EDITORS.

QUESTIONS ON BRAKE-SHOES

Answers to the following questions are requested:

E 66a.—What has been your experience with different types of brake-shoes?

E 66b.—What effect has the type of shoe on the life of the wheel?

E 66c.—How thin is it safe to wear a shoe?

E 66d.—What is the cost of your shoes per 1000 car-miles?

E 66e.—Have you had any trouble with shoes breaking?

E 66f.—What adjustment do you allow between the shoe and the wheel, (1) With air brakes? (2) With hand brakes?

DURABILITY OF STEAM TURBINE VANES

East Pittsburg, Pa., March 31, 1905.

Editors Street Railway Journal:

There has recently been brought to our attention from numerous sources a report upon the alleged short life of the vanes in steam turbines, stated to have been inspired by a European engine builder. The sole evidence rests upon photographs of turbine vanes purported to have worn out with less than one year's service. This report bears all the earmarks of misinformation, if not of malicious falsehood, especially as similar photographs have been covertly circulated in this country as representing the experience in various American turbine plants. We therefore ask the courtesy of your columns for a brief statement of facts, and are content to leave to the good judgment of your readers the conclusions to be drawn therefrom.

The text of our argument we find in the following passage: "As to the cost of maintenance and repairs, it is claimed that there is an enormous wear (meaning erosion) in the back of the turbine blades * * * ." Photographs of both convex and concave sides of a new and a damaged vane are shown. From a careful examination of these photographs we conclude: First, that the supposed erosion is probably due entirely to an accident in which the blade in question had been badly damaged by the flying particles, but not entirely broken off; or, second, that a new blade has been deliberately injured for illustrative purposes; or, third, that it has been in a class of service the severity of which we have no conception.

The photographs in question show that both edges of the blade have been curled over, so that in the position in which the photograph is taken, a considerable portion of metal appears to have been eaten away. There is also conspicuous evidence of the indentation of a round-nosed instrument on one

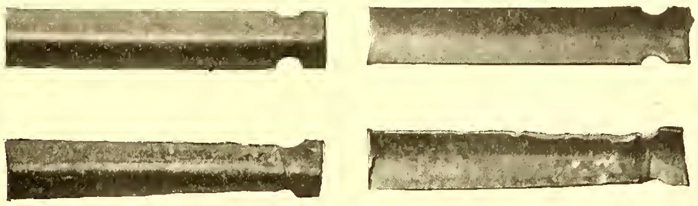
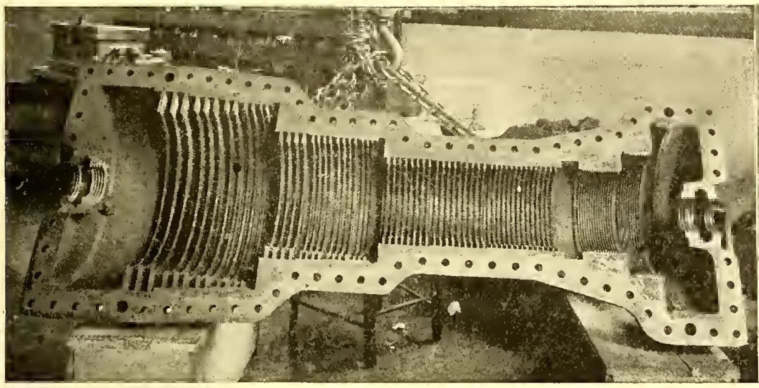


FIG. 1.—VIEWS OF NEW AND OLD BLADES, SHOWING DAMAGE APPARENTLY DUE TO EROSION

of the damaged edges and of a chisel upon the other. Such injury is manifestly not due to normal wear, as the innocent looking title would lead one to believe: "Same bucket after having been in use less than one year."



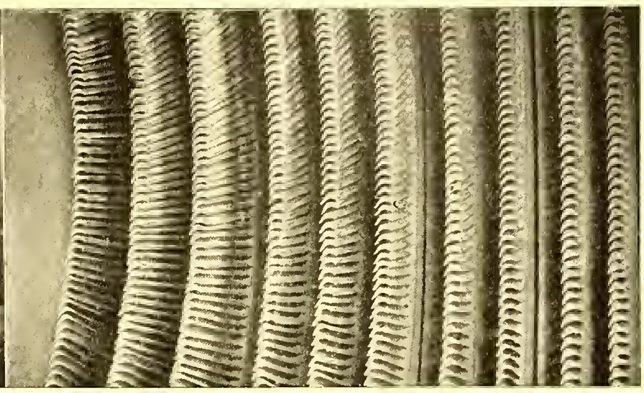
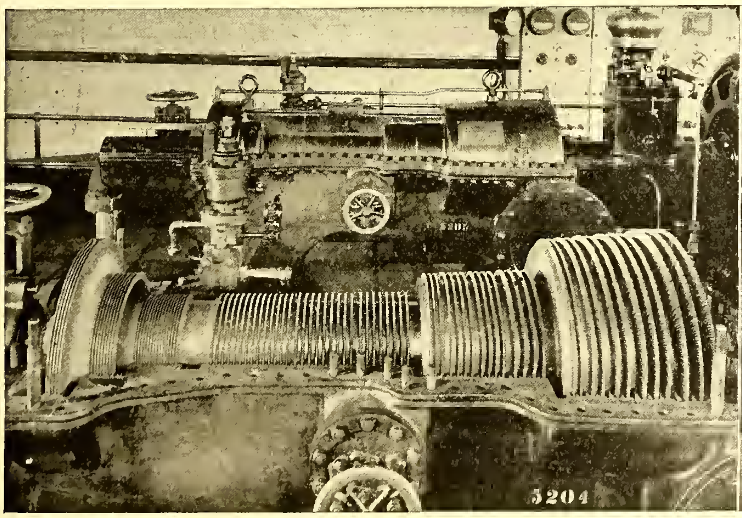


FIG. 2.—INTERIOR AND DETAIL VIEW OF UPPER HALF OF STATOR OF 400-KW TURBINE WHICH HAS BEEN IN CONTINUOUS SERVICE SINCE AUGUST, 1899

A skilful photographer can, by adjusting lights, shades and focus, create most convincing effects. To illustrate, we have photographed a turbine blade (see lower two views in Fig. 1) which was taken out of an experimental machine in which several rows of vanes had been damaged, due to accidental distortion of the casing. This photograph bears a striking resemblance to those referred to above, and shows how easily a false impression may be created. You will observe that this blade bears strong evidence of erosion upon the back (see lower left-hand view in Fig. 1), whereas it was, in fact, a new vane damaged in the manner shown simply by bombardment of small



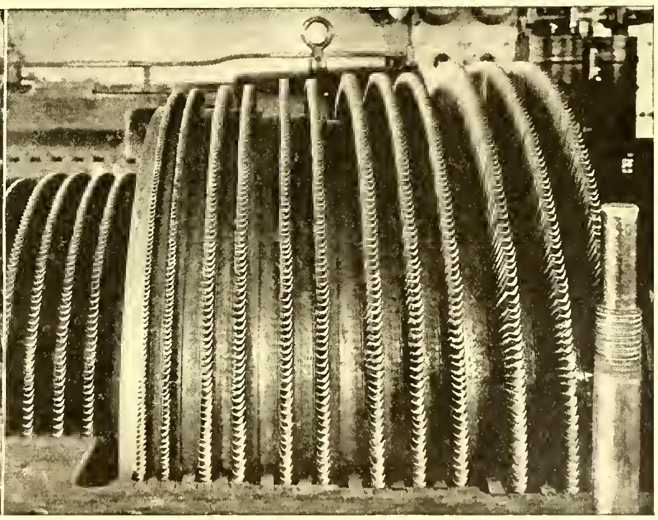


FIG. 3.—VIEWS OF ROTOR OF 400-KW TURBINE IN CONTINUOUS USE SINCE AUGUST, 1899

broken particles of other vanes. If the photograph had been taken slightly out of focus, the edge shown curled over in the two latter views would have appeared to be badly eaten away. The concave surface is, of course, intact..

In support of our contention that steam erosion in the Parsons type of turbine is quite negligible, owing to the low steam velocities employed, we have recently photographed the interior of the first steam turbine put into practical use in America and the first turbine built by us for commercial service. This machine was installed in 1899, and together with the three units installed soon after, has since been in continuous service

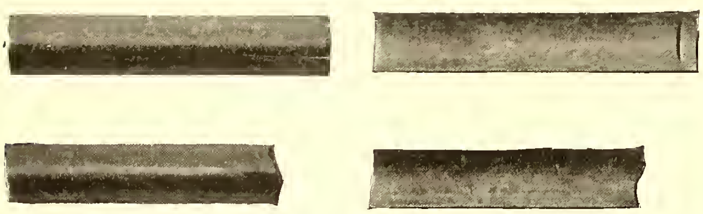


FIG. 4.—WESTINGHOUSE-PARSONS VANE AFTER FIVE AND ONE-HALF YEARS' SERVICE, EIGHTH ROW, LOW-PRESSURE BARREL OF ROTOR, CONVEX AND CONCAVE SIDES

upon a 24-hour factory load. The first views in Figs. 2 and 3 show the upper half of the stator and of the upper half of the rotor, respectively, while the second engravings in each case are closer views of stator and rotor. In the last two views a position was chosen looking directly along the cutting edges of the vanes to show their condition after over five years' continuous service.

In order to exhibit this still more clearly in detail, two vanes were deliberately broken out of the eighth and twelfth rows, respectively, of the low-pressure barrel, where the greatest quantity of moisture occurs, and where erosion would, if at all, be expected. These are shown in Figs. 4 and 5. Although reproduced as sharply as possible, the old vanes are even in better condition than they appear, and their metallic surfaces have retained the original polish of new vanes as they come from the

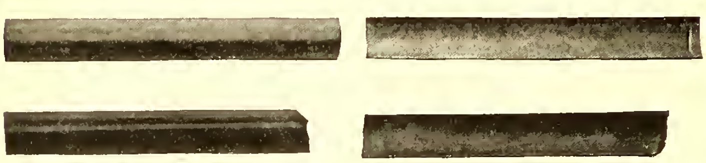


FIG. 5.—CONVEX AND CONCAVE SIDES OF WESTINGHOUSE-PARSONS VANE, TWELFTH ROW, LOW-PRESSURE BARREL

drawing machine. Fig. 6 shows one of these specimens set on edge alongside of a new vane of similar size. The end of the new vane appears rough, as it has been sheared off and not ground true, as would be the case when finally inserted in a finished machine.

Three facts must be apparent from these photographs: First, that the old vane has retained its full cross section, and hence its full mechanical strength; second, that the vane angles, and hence the efficiency, are unimpaired in service; third, that the surfaces along which the working steam passes have not lost their original smoothness.

The only effect traceable to steam wear on the vanes of this turbine is to be found in the case of vanes which have been set slightly out of line with the remaining ones of their particular ring. In such cases the area projecting into the steam space becomes slightly scored on the advancing side, presumably due to their contact with particles of moisture coursing through the lower stages of the turbine during light loads when their velocity in this region is probably somewhat less than normal. This effect, however, but occasionally develops, and simply results in the sharpening of the cutting edges of the vane to such fineness that a piece of heavy cord may readily be severed. In no case has the section of metal been worn away to any appreciable extent. The vane reproduced in Fig. 4 was slightly out of line, and shows this effect as much as any other in the turbine.

In judging the results obtained from this turbine it should be borne in mind that the steam supply has always been excessively wet, owing partly to a long run of steam piping. No superheaters are used. On several occasions the turbines have been checked considerably below their normal speed from the effects of slugs of water passing through them. It also frequently occurs that creek water has to be put into the boilers owing to the failure of city water supply. This water is at all times extremely acid and very impure. In fact, it has been necessary to coat the outer surface of the dummy pistons with white lead to prevent their corrosion from this acid water. Owing to the accumulation of sediment, the turbines have to be frequently cleaned by air blast, as the steam velocities are not sufficient to keep the passages clear.

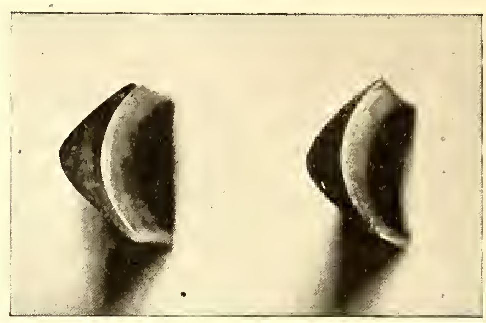


FIG. 6.—SECTION OF VANE IN CONTINUOUS USE SINCE 1899

In conclusion, it should be recalled that the turbine on exhibit represents the beginning of the present turbine industry in America. Its failure would have been even more conspicuous than has been its success. It is therefore reasonable to suppose that improved methods of manufacture and increased understanding of the turbine art should have resulted in an improved machine rather than the reverse, as our detractors would have you believe.

THE WESTINGHOUSE MACHINE COMPANY.

ELECTRIFICATION OF THE LULU ISLAND RAILWAY

An interesting example of the electrification of branches of a steam railroad is offered by the Lulu Island division of the Canadian Pacific Railway. This branch is 15 miles long, and connects Vancouver with Steveston, the center of the salmon canning industry. The farm land along this route is especially adapted to dairying and fruit raising.

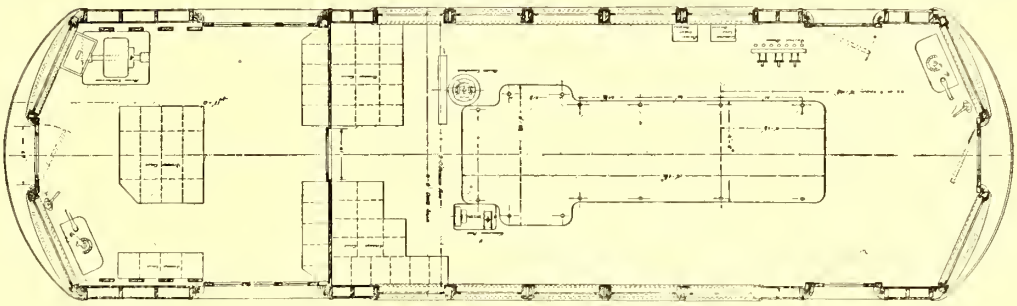
The work of electrification is to be carried out by the British Columbia Electric Railway Company, Ltd., which has made a traffic arrangement, dating from July 1, 1905, with the steam railroad mentioned. The latter is running two trains a day at present. When the electrification is completed, double-truck cars, 48 ft. long, built by the British Columbia Electric Railway Company, will leave the Granville Street station, Vancouver, every hour. There will be one sub-station, this being located near Eburne, 10 miles from Vancouver. It will be equipped with a 500-kw, three-phase rotary made by the Canadian General Electric Company. The line itself offers no special difficulties, the steepest grade being only 3 per cent and the sharpest curve 10 degs. The track consists of 56-lb. T-rails.

To compete with the Worcester Consolidated Street Railway for the patronage of the employees at the large factories in Greendale, the Boston & Maine Railroad has reduced the price of single fare tickets between Worcester and Barbers' Crossing from 10 cents to 5 cents. Heretofore there has been a 6-cent fare on a workingmen's train, and strip tickets were sold at a reduced rate. The Worcester Company still has the advantage of a well developed transfer system.

A GASOLINE-ELECTRIC MOTOR CAR FOR THE ST. JOSEPH VALLEY TRACTION COMPANY

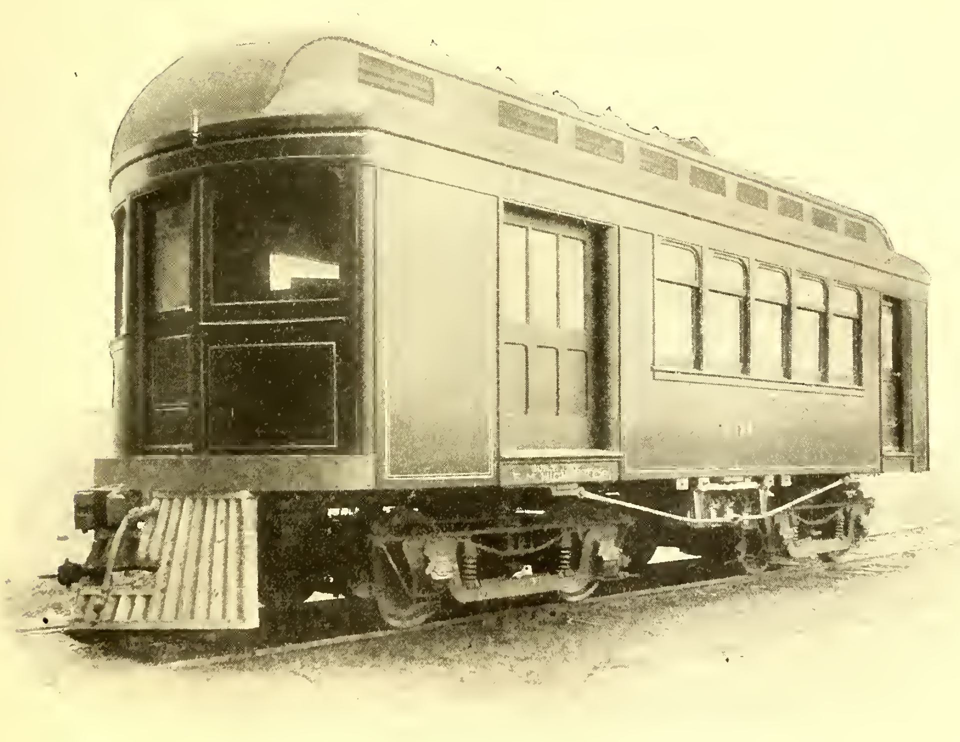
A gasoline-electric motor car has just been completed at the locomotive and car shops of F. M. Hicks & Company, Chicago Heights, Ill., for service on the line of the St. Joseph Valley Traction Company, operating out of La Grange, Ind. H. E. Bucklen, of Chicago, who is president of the St. Joseph Valley Traction Company, is responsible for the trial of this car on his road. The car carries a gasoline engine of 70-brake-hp, a direct-current generator of 50 kw, a storage battery of 120 cells and an equipment of four General Electric 250-volt railway motors, mounted on the trucks in the usual manner. The generator furnishes current to operate the motors and also charges the storage battery when not supplying current to the motors. The storage battery assists the generator during acceleration and on upgrades. Almost the entire car, with the exception of a little room in one end, is given to suplying motive power, thus making it virtually a locomotive, the idea being to have it haul passenger coaches or freight cars, as occasion may require.

The car body is of unusually heavy construction to provide for the concentrated loads upon the floor. The gasoline engine alone weighs 18,000 lbs. and the generator 6000 lbs., this unit being located directly over one of the trucks. Two 6-in., 14¾-lb. I-beams are used for center sills, and the two side sills are 5-in. x 8-in. yellow pine. The four intermediate sills are 4-in. x 6½-in. yellow pine, making eight sills in all. Transverse sills consist of two 8-in. x 12-in. oak timbers at the ends; two transoms over the trucks, each consisting of two wrought-iron plates 1½ ins. thick and 10 ins. wide, and a lot of floor joists 2¼ ins. x 6½ ins. Transverse wrought-iron tie-rods ⅝ in. in diameter tie the underframing together. On the sills is a floor of two thicknesses of ¾-in. pine, separated by a layer of Neponset paper. The side frame is also extra heavy, reinforced by continuous blocking. Heavy wrought-iron carlines serve as trusses across the deck of the car to add to the general stiffness. The body truss rods consist of two 1½-in. rods with 1¾-in. ends. There are two compartments in the car, as can be seen by the accompanying plan. The car is 34 ft. long over the end sills and 9 ft. 8 ins. wide over the side sills. About two-thirds of the space is given up to an engine room, the balance being known as a baggage compartment, although considerable space in the baggage compartment is occupied by storage batteries. The trucks are the St. Louis Car Company's heaviest design of interurban M. C. B. truck.



PLAN OF GASOLINE-ELECTRIC MOTOR CAR

The gasoline engine, which was built by the Marinette Gas Engine Company, of Chicago Heights, Ill., is of the upright marine type, and has four water-jacketed cylinders. This engine has developed 70-brake-hp at 325 r. p. m. in factory tests, with a consumption of 1 pint of gasoline per hp-hour. Water for cooling the jacket is circulated through 800 ft. of ¾-in. automobile radiator pipe, and thence through a supply tank of 190 gals. capacity. This water is kept in constant circulation by a rotary pump belted from the engine shaft. Air is blown through the radiator by two 42-in. fans revolving in a horizontal plane, 300 r. p. m., and placed directly under the radiator, forcing the air out through ventilators in the upper deck.

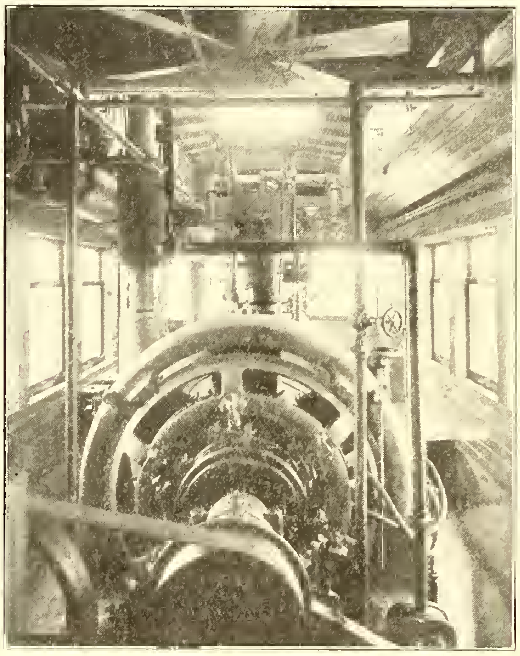


GASOLINE-ELECTRIC MOTOR CAR FOR THE ST. JOSEPH VALLEY TRACTION COMPANY

The generator is a direct-connected shunt-wound Sprague Electric Company machine of 50-kw capacity, giving direct current at 250 volts. This is connected in parallel with a battery of 120 chloride storage cells. The cells are placed in ventilated lockers, which are coated inside with asphaltum paint. The acid fumes from the battery are drawn from the lockers and exhausted through the ventilators by the same fans that force the air through the radiators of the water-jacket system. The battery and generator leads are taken to a switchboard, where they are connected in parallel, and on which switchboard circuit breakers are provided. The voltage of the generator is adjusted with reference to that of the storage battery, with the idea of making the storage battery take whatever load exceeds the capacity of the generator when the car is accelerating on climbing heavy grades.

The car is equipped with the National Electric Company's automatic Christensen air brakes, which are supplied from a 4-hp electric motor compressor of the ordinary type. This is run from the generator and storage battery. There is also a storage battery used in gasoline engine ignition. Besides this, there is another compressor on the car belted from the gasoline engine mentioned.

Two trap doors over the cylinder heads make it possible to remove the heads and pistons readily. The gasoline supply is carried underneath the car in a heavy galvanized iron tank of 125 gals. capacity. A small reciprocating pump driven from the engine supplies gasoline. All excess gasoline gravitates back to the reservoir through an overflow pipe. Two methods of starting the gasoline engine are provided, one is that of driving the generator as a motor from the storage battery until it can draw in a charge of gasoline so as to run itself. To do this the fields of the generator are fully excited and the armature is connected to the storage battery through a four-point rheostatic switch. The other method of starting the engine which is provided is by compressed air. To provide air for this purpose an air compressor with a capacity of 5.9 cu. ft. of air per minute is belted to the engine shaft. This runs at 165 r. p. m. and maintains a pressure of 200 lbs. per square inch in two steel reservoirs. These reservoirs are connected through



VIEW OF GENERATING EQUIPMENT

a reducing valve to the storage reservoir of the air-brake system. A pressure of 90 lbs. per square inch is maintained in the latter. This gives the air-brake system a reserve supply of air should the motor compressor be out of order.

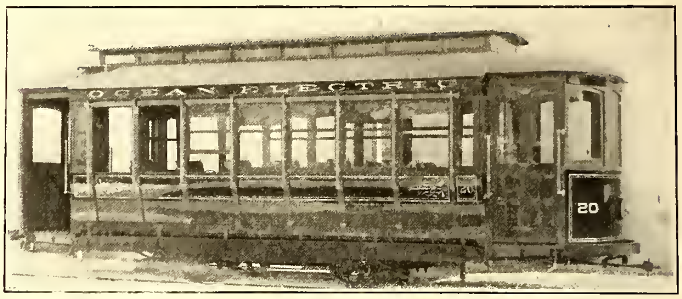
The weights of the various parts of this locomotive car are, as follows:

	Pounds.
Motors	10,000
Gasoline engine	18,000
Generator	6,000
Batteries	9,250
Compressors	800
Truck and car body	33,600
Gasoline storage tank	2,000
Water tank and circulating system	2,000
Miscellaneous	4,000
Total	85,650

On a recent trial run made on the tracks of the Chicago Terminal Transfer Railway between Chicago Heights and Harvey, a speed of 25 m.p.h. was attained. The current consumption of the motors at this speed is stated to be 140 amps., all of which was delivered by the generator, which, in addition, was supplying about 15 amps. to charge the storage battery. During acceleration the current rose as high as 300 amps.

CONVERTIBLE CARS FOR GREATER NEW YORK

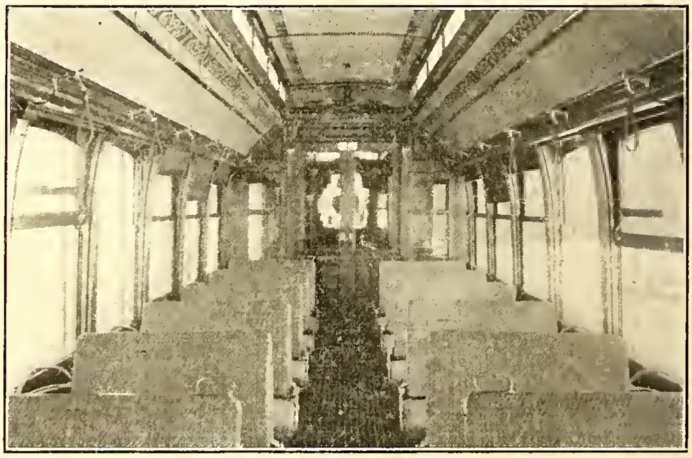
Convertible cars of the type shown in the accompanying illustrations have recently been delivered by the J. G. Brill Company to the Long Island Railroad Company. From the first of June until the first of October the cars will be operated on the 1½-mile line extending from Far Rockaway to the ocean. Far Rockaway, which is within forty minutes of New York, is a splendid seaside resort and attracts during the season an immense number of visitors. Thus the electric cars are largely patronized. The convertible type of car should give excellent satisfaction, as it permits rapid loading and unloading of passengers, and in case of a sudden storm may be quickly and easily changed from an open to a closed car. Several con-



SINGLE-TRUCK CONVERTIBLE CAR FOR SEASIDE SERVICE

vertibles which have been installed on other electric lines of the Long Island Railroad Company now stand in high favor.

The larger car shown is seated for forty passengers, and is 30 ft. 8 ins. over the end panels and 8 ft. 1 in. over the posts at the belt, and the smaller car is seated for twenty-eight passengers, and is 20 ft. 7 ins. over the end panels and 7 ft. 9 ins. over the posts at the belt. The vestibule sashes are composed of single lights and are arranged to drop into pockets. The sashes and panels of the cars are raised into roof pockets when

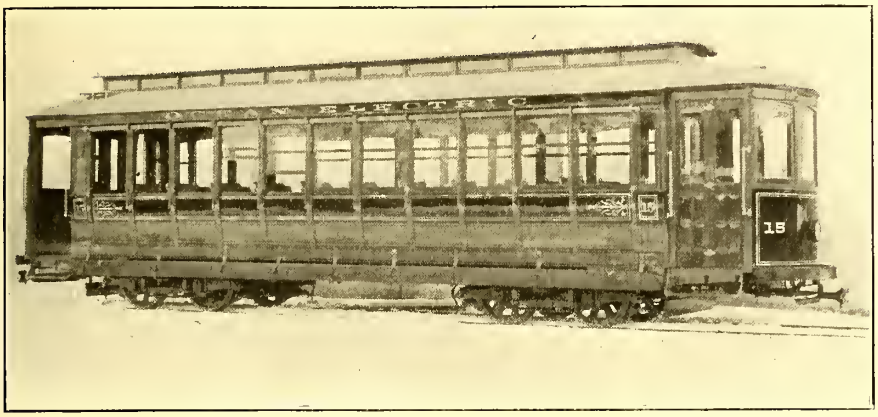


SEATING ARRANGEMENT OF CONVERTIBLE CAR

not in use. The spring cane seats are of the step-over type and have grab handles attached to them. Cherry, with birch ceilings neatly decorated, constitutes the interior finish of the cars.

The larger car is 40 ft. 1 in. over the crown pieces and vestibules, and the panel over crown pieces is 4 ft. 8½ ins. The width over the sills and the panels is 7 ft. 5½ ins., and over the posts at the belt, 8 ft. 1 in. The sweep of the posts is 3½ ins. The size of the side sill is 4¾ ins. x 7 ins.; sill plates, ⅝ in. x 8 ins.; thickness of the corner posts, 3¾ ins.; thickness of the side post, 3⅝ ins. The car is mounted on No. 27-F high-speed trucks, with a 4-ft. wheel base and 33-in. wheels.

The smaller car is 30 ft. long over the crown pieces and the vestibules, and the panel over the crown piece is 4 ft. 8½ ins.; width over the sills and the panels, 6 ft. 11¼ ins.; width over the posts at the belt, 7 ft. 9 ins.; sweep of the posts, 5 ins.; side sill size, 5¼ ins. x 6 ins.; end sill size, 4¼ ins. x 6 ins.; sill plates, 6 ins. x ⅝ in.; thickness of the corner posts, 3¾ ins., and of the side posts, 3⅜ ins. The car is mounted on the No. 21-E single truck, with an 8-ft. wheel base and 33-in. wheels.



DOUBLE-TRUCK CONVERTIBLE CAR FOR SEASIDE SERVICE

Angle-iron bumpers, radial draw-bars, etc., are among the Brill patented specialties included in the furnishings of these cars.

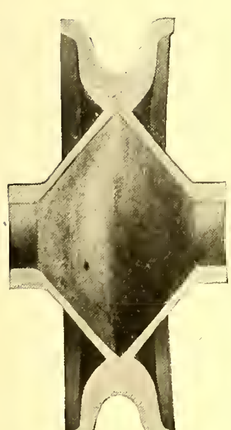
THE AMESBURY TROLLEY WHEEL

The Climax Ignitor Company, of Amesbury, Mass., through its exclusive selling agents, the Stuart-Howland Company, of Boston, has recently placed on the market a new type of self-lubricating trolley wheel which possesses a number of valuable features, besides its ability to run without the addition of any oil or grease. In a number of tests which this wheel has been given, it has shown remarkable wearing qualities; in fact, in a service extending over thirty-one days on a double-pole car, one end of which was equipped with the Amesbury wheel and the other with the ordinary wheel, the former ran with no attention, while on the other pole thirty bushings and several wheels were worn out. A view of this Amesbury wheel is shown herewith.

The wheel itself is made up of new copper, which by a special alloy is rendered very hard and tough, though not brittle, and has great durability. The special feature of the wheel, however, is its self-lubricating quality. As will be seen from the accompanying engravings, the wheel is hollow, with flaring sides, forming a chamber which is filled at the factory with a grease of peculiar composition, which melts slightly under the heat of operation. The one filling is more than sufficient for lubrication as long as the wheel lasts. The usual necessity of frequently oiling is therefore removed, and the common annoyance of oil dripping on car top is entirely overcome.

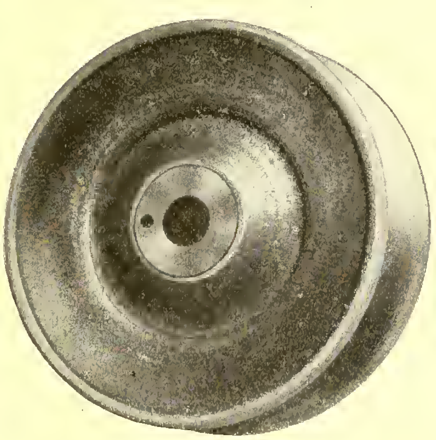
The bushing is made of a special soft iron designed to be run only on a hard pin. Several oil holes feed the lubricant through, and grooves help to distribute it over the pins. This bushing lasts longer than the wheel, a feature which perhaps has never been known before in trolley wheel construction, and one which the manufacturers claim is of great advantage. Wheels leave the wire chiefly because worn bushings allow wabbling, and in many cases wheels will wabble so much after service of a few hours, or a few days at most, that they leave the wire frequently and cause a great deal of trouble and often damage. For a wheel to run true and smooth on its bearing as long as the wheel itself lasts is a feature of such importance that all practical railway men will at once see its value. A peculiar claim made for this bushing is that the material is of such a nature as to allow the current to flow more freely than is usual through the wheel, reducing the arcing which is so common, and effecting a great saving of trolley wire. It is a matter of common knowledge that the wire in many cases is worn more by arcing than by friction.

The Amesbury wheels are made in standard sizes of 4-in. and 5-in. diameter, with 1½-in. bearings for either ½-in. or ⅝-in. pins, and of 6-in. diameter with 3-in. hub. This last is especially designed for extra high-speed and high-powered cars, and has already been adopted by one of the most important and best equipped roads in New England after a most satisfactory test. The 4-in. wheel is being adopted by other lines, but the makers have not given their product general publicity before now, preferring to wait until they should have finished their very exhaustive tests in actual service under hard conditions. Wherever tests have been made the results have been highly satisfactory, and the manufacturers believe that the wheel will meet a very favorable reception in all parts of the country. Although higher in price than other wheels, it is claimed to be actually less expensive, because the first cost is the only expense, all cost of extra bushings, oiling and labor being eliminated.

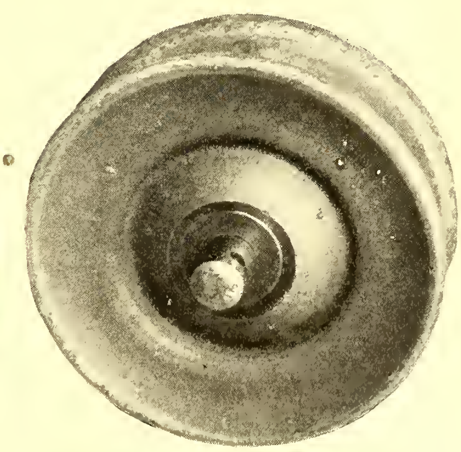


CROSS SECTION OF 6-IN. WHEEL

CROSS SECTION OF 4-IN. WHEEL



APPEARANCE OF NEW 4-IN. TROLLEY WHEEL



AN AMESBURY TROLLEY WHEEL AFTER THIRTY-ONE DAYS' CONTINUOUS SERVICE

In the rapid development of the street railway business much attention has been given to the heavy portions of the equipment, but the time has now come when much careful thought must be given to the small and less expensive items. It is a fact well known to some that many railway officials have no conception of the amount of trouble experienced at car houses and on the road in the use of cheap trolley wheels and bushings. These are often made of junk so as to sell at a low price, and on many interurban roads where the service is hard, it is not unusual for change of bushings to be made daily, and for a bushing to last two or three days in this service is often the best that can be expected.

Managers should also take into consideration another matter of much importance. Where bushings give out frequently there are many delays in the operation of cars, and every such delay means extra power expended in making up time. The cost of this extra power per year must be a very large item on some roads.

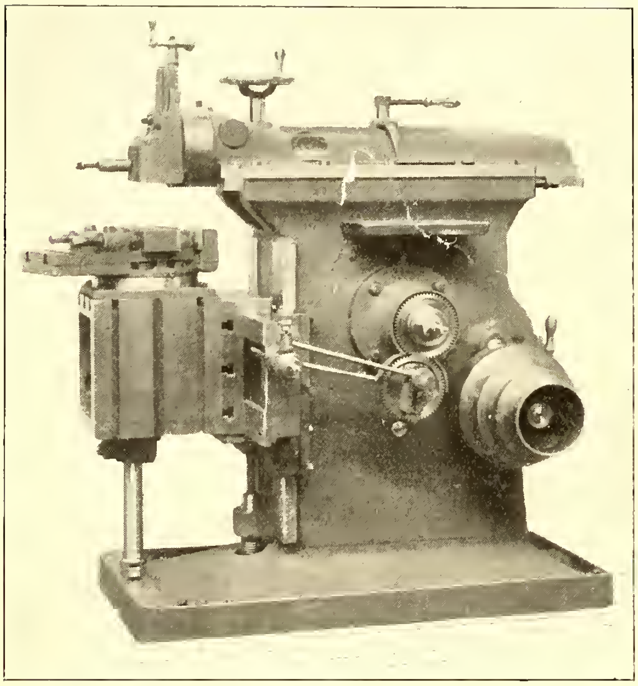
A NEW HIGH DUTY SHAPER

Many improvements in the design of shapers have been made during the past few years, not only to facilitate machining operations, but also to extend the range of work of each tool. But with the introduction of the new high-speed tool steels for cutting tools, and also of the many advanced and improved methods of machine shop operation, such radical and extreme requirements have been imposed upon machine tools that heroic treatment has in many cases been found necessary to enable them to cope with operating conditions. No one has been more appreciative, however, of the requirements that have been made in this direction than has the Cincinnati Shaper Company, Cincinnati, Ohio, which has made many improvements in the detail of its shapers in anticipation of what was foreseen as necessary.

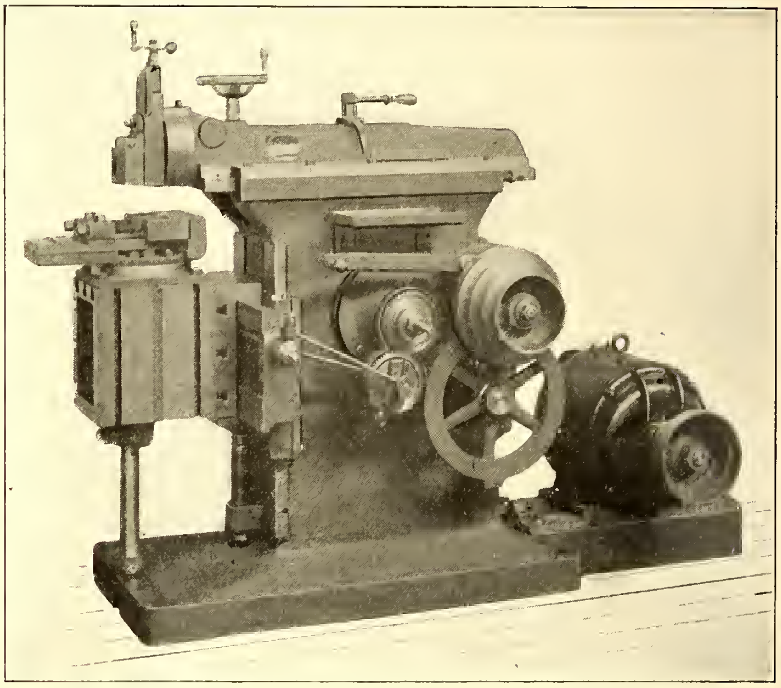
The new "Cincinnati" high-duty shaping machines illustrated herewith are examples of the latest efforts of this company to produce a tool that will be capable of a greater production than any other that has been built and which will withstand more severe usage than has heretofore been expected of shop tools. These elements, which have been very successfully embodied in these new tools, make them particularly applicable to the conditions met in street railway shop operation, and a description of them will be of interest and value to railway shop men.

The engravings illustrate the new 16-in. high-duty "Cincinnati" shaper, first as arranged for belt driving, and second as equipped with a self-contained motor drive—the latest and most approved method of tool operation for railway shops. In the former case the tool is equipped with the usual style of four-step belt cone by which it is driven from a countershaft in the usual manner. In the second case, it will be noticed that the motor is mounted on an extension of the base of the shaper, while in place of the usual cone pulley upon the initial shaft in the regular belt-driven machine a large gear is mounted, which is driven through a pinion upon an auxiliary shaft directly above it, which carries a four-step cone pulley to correspond with that upon the motor. The lever shown above the auxiliary shaft is for the operation of a brake, which is very serviceable for stopping the machine for adjustment or other purposes.

As to mechanical detail, this new shaper is geared so as to make it one of the most powerful shaping tools for its size that has been built. In spite of this, however, the fact has not been overlooked that it is necessary to withstand the peculiar and excessive strains to which the shaper is subjected when operated in the modern heavy-duty service, and consequently all



THE NEW DESIGN OF THE CINCINNATI SHAPER FOR HEAVY-DUTY MACHINE WORK



THE STANDARD EQUIPMENT OF THE CINCINNATI HEAVY-DUTY SHAPER FOR MOTOR DRIVING

parts have been strengthened to cover the most extreme requirements. The column is of considerably greater weight and strength, having been more heavily ribbed and braced internally for a maximum of rigidity. The ram has a wider and longer bearing on the column, and is also, like the rail, greatly stiffened for the heavier work to which the tool is adapted. The head swivels to any angle and is provided with a locking device, and also an interesting design of down feed. As shown, an outer support is supplied under the table, which is capable of cross travel with the table.

An interesting feature has been introduced in the journal bearings of the main gear, inasmuch as each is provided with a two-stepped bearing, the inner step or end of the journal being of twice the diameter of the outer end; this will overcome any tendency toward breaking of the shaft near the gear seat, and in addition provides a bearing of great rigidity and wearing qualities. The crank block is, in the new machines, made of a steel forging, and is set well into the cup of the gear, permitting the rocker arm to travel close to its edge, and thus avoid the usual overhang. Taper gibs of one length are provided throughout, which are adjustable endwise by single screws for taking up wear; these are provided for the arm, head, rail, apron and crank wheel slides, as, while much more expensive to make, they are far preferable to the more usual style of gibs with set screws impinging with varying pressures at several points in the length of a gib. Also ball bearings are provided under the elevating screw to the rail.

The machine has a back gear drive, the ratio of which is 6:1 with it out and 24:1 with it in, the latter being the highest gearing ratio that has been applied to a shaper, giving to it the greatest possible advantage in heavy cutting duty. The motor-driven machine, as illustrated on the previous page, is driven by a 5-hp direct-current motor supplied by the Triumph Electric Company, although any other make of motor is obviously applicable for this purpose; in fact, three machines of the same size and similarly equipped have been built for the Thomson-Houston branch of the General Electric Company for use with 5-hp General Electric motors operating at 1800 revolutions.

GENERAL DIMENSIONS OF THE BELT-DRIVEN SHAPER

Extreme length of stroke	16½	ins.
Greatest distance table to ram	17⅝	"
Least distance table to ram	3⅝	"
Vertical travel of table	14	"
Horizontal travel of table	20	"
Diameter of head	8	"
Feed to head	7	"
Length of top of table	12	"
Width of top of table	11	"
Depth of table	13	"
Length of ram bearing in column	29	"
Width of ram bearing in column	10½	"
Key-seating capacity, diameter	3	"
Size of vise jaws	10 x 2	"
Vise opens	8¼	"
Width of double belt	2½	"
Number of speeds to ram	8	
Weight of machine and countershaft, net	2600	lbs.

A NEW MOTOR-STARTING PANEL WITH CIRCUIT BREAKER FOR INDIVIDUAL DRIVING

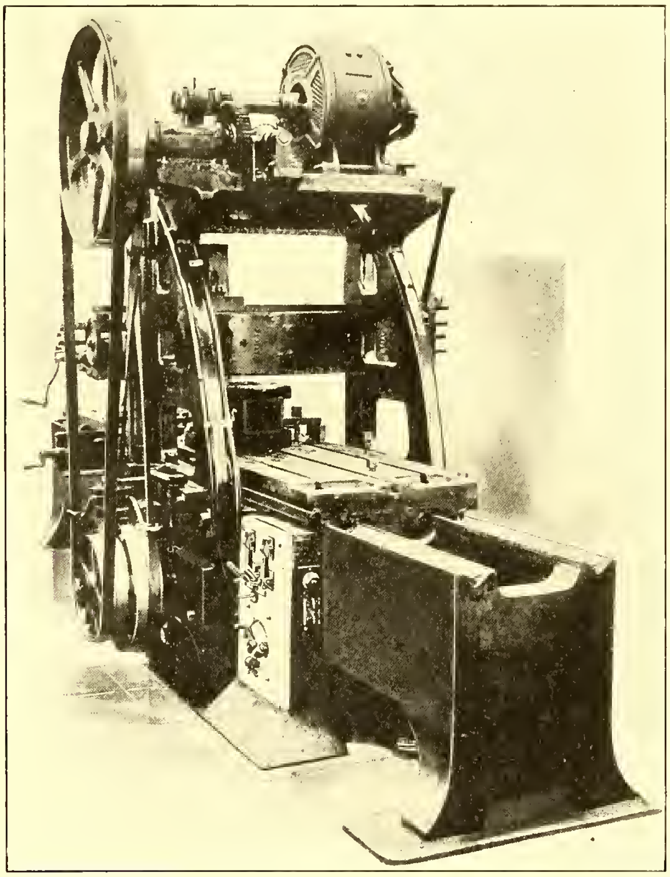
One of the recent changes for the better in electrical practice is to be noted in the increasing use of switchboard panels containing the control apparatus for individual motors, employed for driving machine tools and other classes of machinery. Before their introduction and in those installations where they are not yet used, controlling rheostats, line switches and protective devices have been mounted in the most convenient place available, often with apparent disregard of fire risk or the protection of the operator. The use of a self-contained panel insures the proper mounting of the apparatus and provides a neat and convenient arrangement, with means for easily mounting in any desired location.

The accompanying illustration shows one of the new styles of starting panels for direct-current motors designed by the Westinghouse Electric & Manufacturing Company, and employing a two-pole type-D circuit breaker instead of the customary switch with fuses. The circuit breaker is, especially adapted for this use, as one pole is connected in each leg of the circuit, the poles closing independently, but tripping simultaneously. In closing the circuit, if there is an overload upon the line, the pole first closed opens immediately upon closing the second, thus instantly interrupting the circuit and preventing damage. It is strongly built, with few parts, none of which are small. It is provided with hinged, movable contacts of the brush type, and with carbon tips, to which the current is shunted when the circuit is broken, preventing sparking at the contacts. The circuit is fully broken at the contacts before there is any movement of the carbon tips. There are no springs except the strong strip of spring steel which carries the carbons, the blow of the armature tending to open the breaker and not simply to release the moving parts. The device is reliable in its action, and is adjustable for different loads.

These panels with circuit breakers are furnished in two styles; those with field rheostats for motors requiring shunt field regulation for varying speed, and those without field rheostats for constant-speed motors. A starting rheostat with minimum voltage release is generally employed with Westinghouse motors; as soon as the supply circuit is interrupted, the rheostat will then automatically open the circuit, making it impossible to damage the motor by restoring full line potential to the circuit when the motor is at rest.

The field rheostat ordinarily provided with Westinghouse motors is mechanically strong, and will stand continuously the field current of the machine with which it is used, in any position of the handle. No combustible material is used in its construction.

The slab is of slate, with a dull black marine finish, harmonizing with the black oxide finish of the apparatus. Brackets



MOTOR-STARTING PANEL MOUNTED DIRECTLY ON THE RIGHT-HAND SIDE OF THE PLANER BED

may be supplied for wall mounting, when ordered, or gas pipe frames of rigid construction can be provided for mounting upon the floor. These panels range in capacity from ⅛ hp to 50 hp at 110 volts, and from ⅛ hp to 100 hp at 220 volts; the sizes of the panels vary from 11 ins. x 23 ins. x 1 in. to 20 ins. x 48 ins. x 1¼ ins., according to the space required for the apparatus. These panels are designed in strict accordance with government specifications and answer all requirements of the most rigid inspection.

They are especially adapted for separate machine tool driving, being so designed as to permit mounting directly on the frame of the machine tool driven by the motor, as shown in the accompanying illustration. As may be noted from this illustration, the panel is mounted on the right-hand side of the bed of the planer and back of the housing, so as to be out of the way and clear of metal chips. This tool, as shown, is a 32-in. x 32-in. x 10-ft. planer, installed in the Omaha, Neb., shops of the Union Pacific Railroad, and is driven by a 5-hp type-S Westinghouse direct-current motor.

ATTRACTIONS FOR AMUSEMENT RESORTS

The article on park amusements published in the STREET RAILWAY JOURNAL of March 11, while describing a large number of popular amusement devices, said but little about the construction of such parks or the methods which have been developed in furnishing them with variety acts, circus performances, band music and other elaborate attractions. While many of the parks are private enterprises, still a large number are owned or controlled by railway companies, so that the latter must be vitally interested in the developments that are taking place in this field. As an example of the better results that a railway company can secure from the exploitation of its picnic grounds, reference may be made to the Rochester Railway Company, which is now having a park amusement concern convert its park at Glen Haven into a much more attractive place, to be called

DREAMLAND AT ROCHESTER

When Robert F. Walter, of the Walter Circuit of Amusement Parks, determined to invade Rochester with a modern outing place where the latest high-class attractions could be offered, he learned that the ideal spot for this purpose was Glen Haven, held by the Rochester Railway Company. After a number of conferences with General Manager Danforth and Superintendent Willcoxen, Mr. Walter closed a contract with the railway company to take over the entire property for five years, with the privilege of renewing the contract for five years more. Although this agreement was made but a few weeks ago, the various amusement buildings are already in process of erection, and the railway company is laying a double-track extension through the glen, fitting up new rolling stock and tearing down freight and storage sheds to make way for transfer platforms and waiting rooms. Glen Haven is only twenty minutes ride on a beautiful scenic line from Rochester's famous Four Corners.

While Rochester's Dreamland will not be the largest in the Walter circuit, it will be the most attractive, owing to the combination of its natural beauties with the pleasure devices introduced by man. The park, therefore, can offer among its attractions a splendid summer hotel, with the best dining facilities, boating, fishing and bathing, besides a vaudeville theater with weekly changes of bill, open air band concerts, outdoor circus, Houses of Trouble, Myth Cities, Creation and Hereafter, Tyrolean Alps, Ye Olde Mill and a score of other modern entertainments. In fact, the increase in traffic is expected to be so great that the Rochester Railway Company will be prepared to run cars on forty-five seconds' headway during the hours of heaviest traffic.

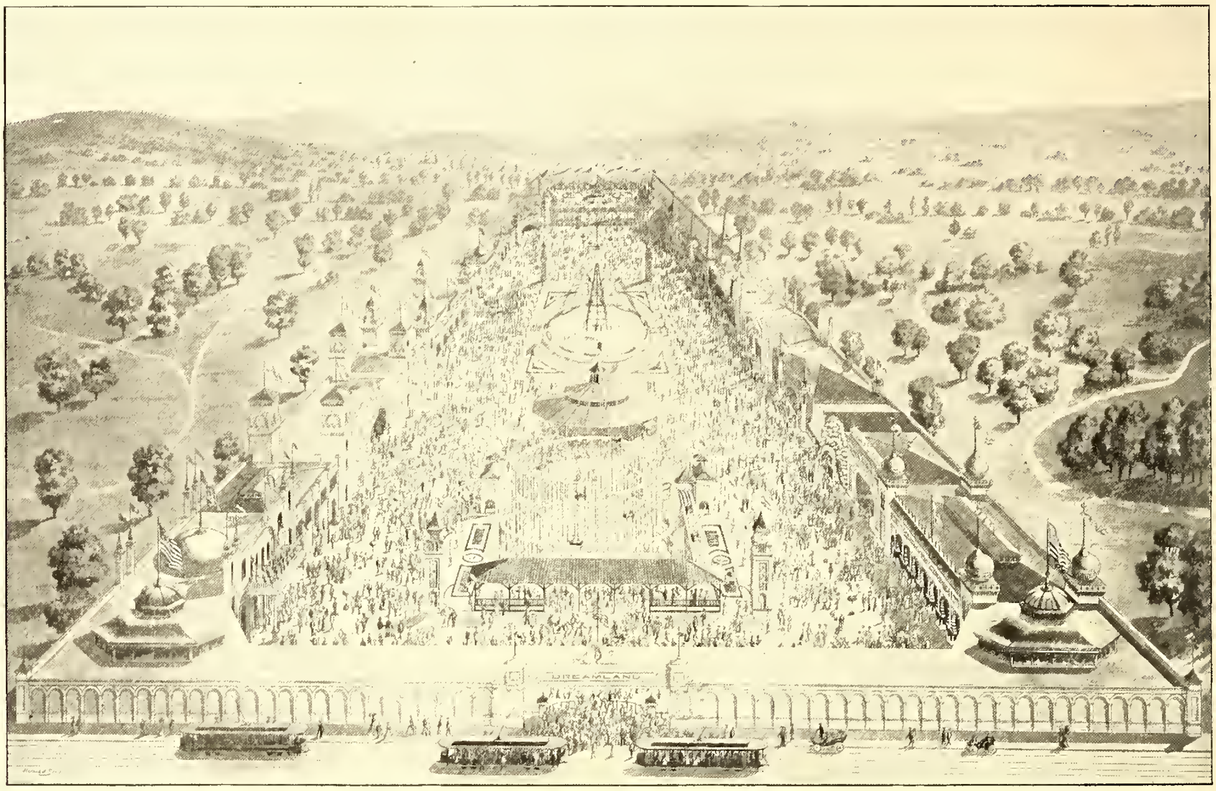
Among other large parks in the Robert F. Walter circuit are "Dreamland" between Troy and Albany, "Dreamland" at Cincinnati, and the noted Athletic Amusement Park at Buffalo.

COMIC OPERA AND MUSICAL COMEDY SUCCESSES FOR SUMMER PARKS

A. G. Delamater, of New York, who for several years past has been connected with the leading musical organizations, including F. C. Whitney's productions, Stange and Edwards operas, etc., has made an entirely new departure, and is organizing several companies to present recent New York comic opera and musical comedy successes in the summer parks. He either rents the theaters or supplies the attractions on a percentage basis, as may be desired.

HIGH-CLASS BAND MUSIC

A review of the attractions that are now presented at the leading amusement resorts shows how superior they are to the vulgar performances current a few years ago. This is especially apparent in the grade of band music furnished, hence it is not surprising to learn that so prominent a band master as Francesco Fanciulli is preparing to tour the better class of picnic parks during the coming summer season. Mr. Fanciulli is a resident of New York, where he has been conducting the Seventy-First Regiment Band, which is well known for the excellence of its Central Park concerts. Previous to his connection with this organization, Mr. Fanciulli led the famous Marine Band, of Washington, for five years, and before that time he was associated with Patrick S. Gilmore. During past years his band has taken prominent part in such great events as the Dewey festivities, in New York; the reception to the fleets of Admirals Sampson and Schley; the 250th anniversary

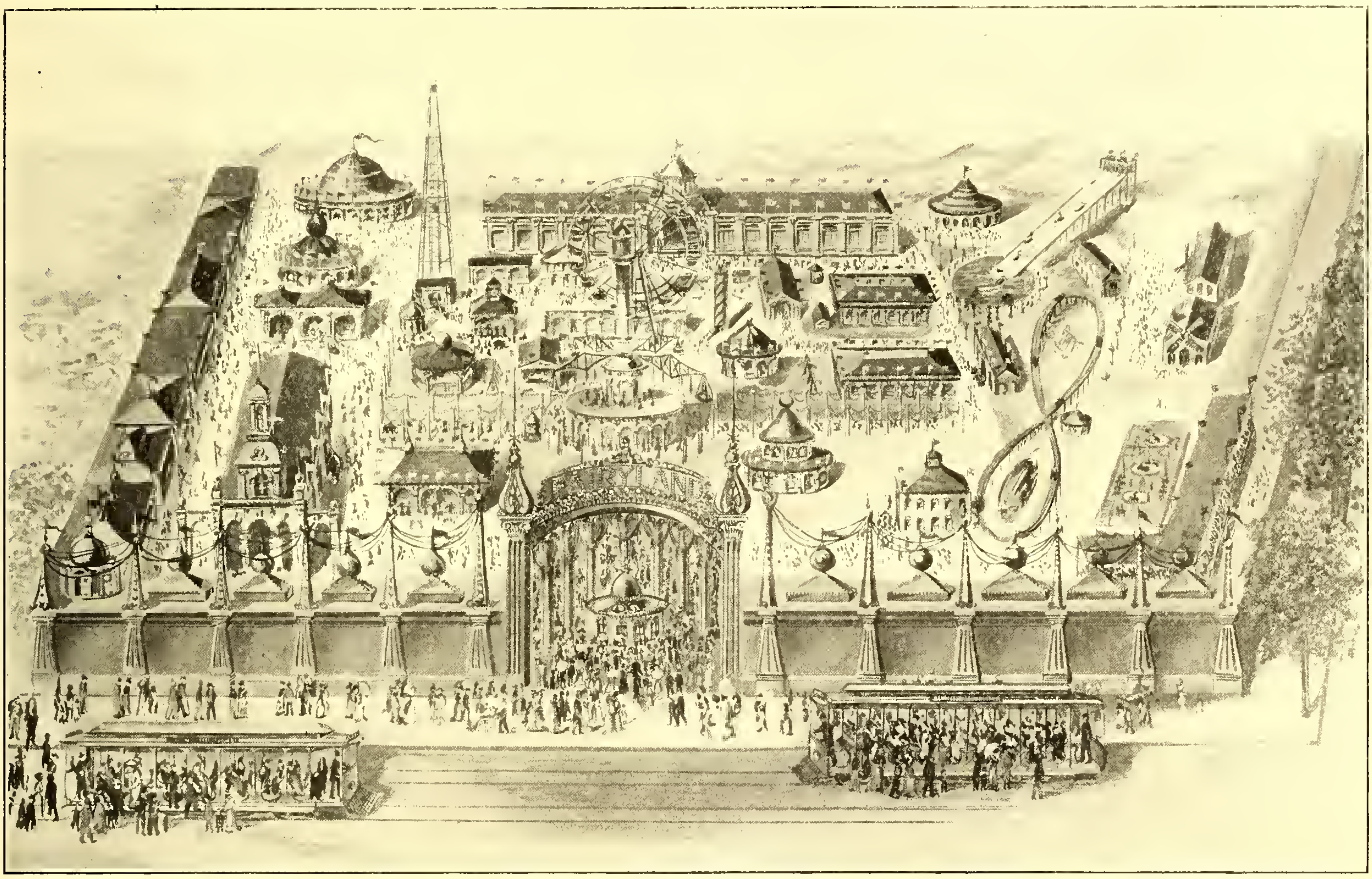


A VIEW OF DREAMLAND PARK, ALBANY, N. Y.

of the Charter of the City of New York; the dedication of the Temple of Music at the Pan-American Exposition, and the Louisiana Purchase Exposition. The reputation that he has gained by his past efforts in catering to the musical public gives reason to believe that he will also meet with success in this field. The business manager of this organization is J. S. Fanciulli, of New York.

FAIRYLAND PARK

It is certain that the best way to keep a park making money is to be able to offer a frequent change of bill, so that the same people will be led to visit the park again and again. Such changes are very expensive, however, unless the attractions are furnished by some good booking agency which is in a position to offer any desired shows at the time wanted, owing to the fact that the people in its employ are shifted from one resort of its circuit to another instead of staying in one place all season. One of the best known circuit managers today is Frank Melville, of New York, whose attractions are engaged to play in a large number of railway parks. Mr. Melville's knowledge of both the theatrical fraternity and the tastes of the public in different parts of the country has enabled him to turn many unprofitable parks into money-makers. Aside from booking attractions, Mr. Melville frequently carries out the planning and construction of large pleasure resorts. A case in point is "Fairyland Park," now in course of erection at Paterson, N. J. This park will appeal to over a quarter million people, who for a 5-cent, or at most a 10-cent fare, will be able to visit the new Coney Island without spending the extra dollar which would be required for a round-trip ticket to the old one, besides saving over three or four hours tedious riding. Fairyland Park will feature the best bands procurable, have a free open air circus, vaudeville theater, dance hall, figure eight roller coaster, merry-go-round, Ye Olde Mill, Maxim flying machine, Ferris wheel, Japanese tea garden, Katzenjammer Castle, Cave of the Winds, fire-fighting exhibitions, etc. The theater and circus rings' programmes will be changed weekly. At night the whole park will be splendidly illuminated by some 20,000 electric lamps, for which current is to be furnished by the Public Service Corporation of New Jersey. The latter company will also be prepared to carry visitors from Paterson to the park within twelve minutes, and in even less time from Passaic. An attractive and useful feature will be the dressing of all the male employees in handsome uniforms of blue, with yellow and gold trimmings. The girls employed as cashiers, standkeepers, etc., will also be neatly uniformed. Mr. Melville is prepared to construct for railway companies other parks of this character, carrying out, of course, such modifications as the local conditions appear to make advisable.



A PANORAMIC VIEW OF FAIRYLAND PARK, NOW BEING ERECTED NEAR PATERSON, N. J.

THE BASEBALL GALLERY

The latest form of amusement for parks, fairs and seaside resorts designed by the Twentieth Century Amusement Company, of Boston, Mass., appeals to every lover of the great game of baseball, just as the rifle gallery appeals to the man who prides himself upon his marksmanship or who desires to excel in that sport.

It is not mechanical in any sense, save that the ball is automatically pitched. The striker at the bat not only needs skill to place the ball, but, according to his skill, he may make a base, two-base, three-base hit or a home run. A well-directed strike hits a target 20 ft. away, the accuracy of the blow and the strength behind it being registered on a miniature baseball diamond, a dial, miniature men or discs, standing at the home plate, starting to first base, second base, third base or a home run, according to the skill of the batter; while, on the other hand, it is "three strikes and out" if the striker is not successful in making a base. This probably is sufficient to give an idea of the interest that can be worked up in the game.

It has been proved what the device will do. The first gallery was built at Revere Beach. This was experimental, while the inventor was trying to develop his idea and build a perfect machine. It was tried on the public only at such times as it was practical to put a man in charge to try it out. Under these most disadvantageous conditions this first machine averaged $3.50 per hour.

The baseball gallery in its improved and perfected shape is now right in every detail, and will be ready for delivery for use during the coming season. It occupies no more space than 25 ft. x 12 ft., about the size of the ordinary rifle gallery, while it will appeal to a much larger clientele. It is the new thing of 1905, adapted to the American taste and idea, filling just the want of those who want "something new under the sun."

BASEBALL GALLERY, WITH MECHANICAL PITCHER

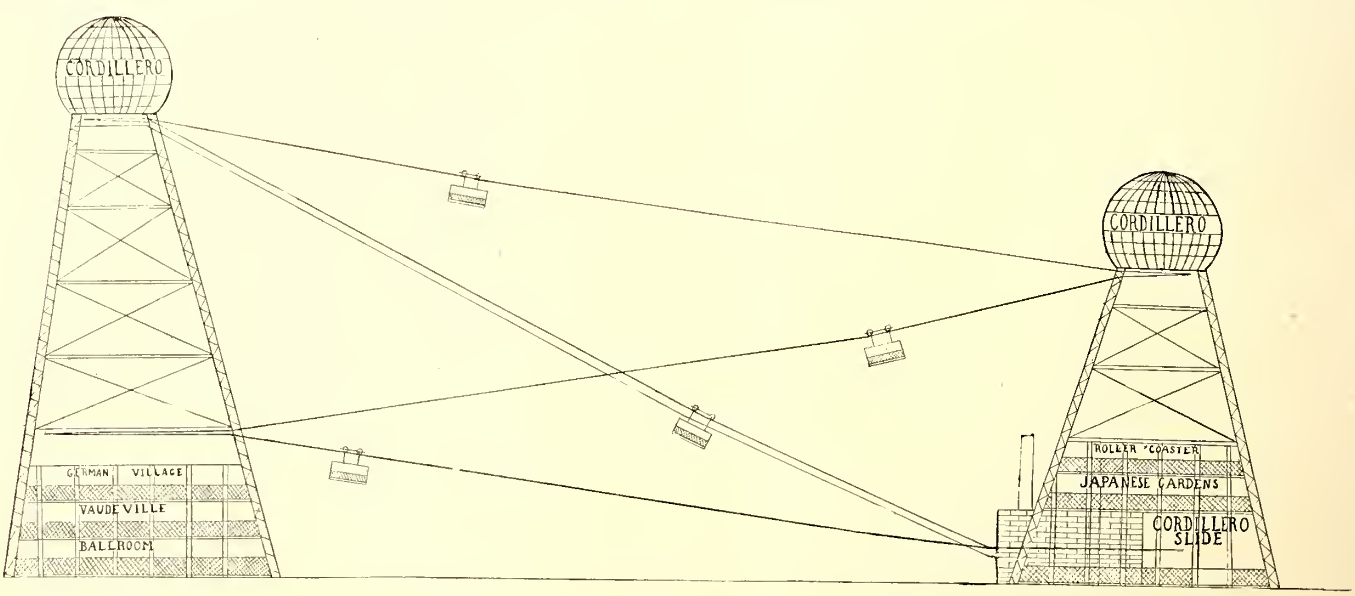
A nickel is charged for three strikes. The player grasps a regulation bat. A regulation ball is tossed to him automatically. He hits the ball a clean, hard hit, to the infield (marked 1 on the target). A disc (representing the runner) on the dial runs to first base and stops. On his second strike the player may land the ball in the outfield (marked 2 on the target). This sends the first runner to the third base and the second runner to the second base. The player's third strike, we will say, results in landing one against the fence (marked 3 on the target). This is good for a "three-bagger," and the third runner on the dial runs to third and stops, sending in the two runners which had reached second and third; but should he, on his third strike, have landed his ball over the fence (marked 4 on the target) he would have sent the third runner round the dial, making a home run, sending in the two ahead of him who were on the bases. In other words, the result of the strikes is registered automatically on the dial in full view of the player and the public, by the little figures actually running the bases.

THE CORDILLERO SLIDE

Only a brief reference was made in the March 11 issue to the Cordillero Slide, designed by Clark Ball, of New York, but since that time further details and an illustration have become available. The slide consists of two towers set 400 ft. apart, constructed of steel throughout. The highest tower is 200 ft. over all. The towers are pyramidal in shape, being 150 ft. x 150 ft. at the base and 50 ft. x 50 ft. at the top. On the top of the towers is set a ball made of iron bands, which can be studded with electric lamps, and bears the name in electric letters, "Cordillero Slide." Between the two towers are slung cables, from which are suspended cars for the transportation of the public, the descending grade of the cables being sufficient to allow the cars to descend entirely by gravity. Inside the towers are set tracks on which the car travels after leaving the cables. The track is arranged so that when a car enters the tower it turns in a large circle and comes out to descend to the other tower. From the base of the lower tower the cars are drawn to the top of the higher one by a cableway controlled by electricity, machinery for the same being located in the base of the lower tower. The towers are in turn anchored by having one or two cables securely anchored.

The cars are to have a light steel frame, covered with wicker work or wire meshing, sufficient for the occupants to see through, but at the same time preventing them from putting their heads or arms outside. The center part is to be raised sufficiently for the guard in charge of the car to see over the heads of the people in front. There is a device for gripping the cable to be drawn to the top of the car, and a brake for use in stopping at any dangerous speeds and at the starting and stopping points.

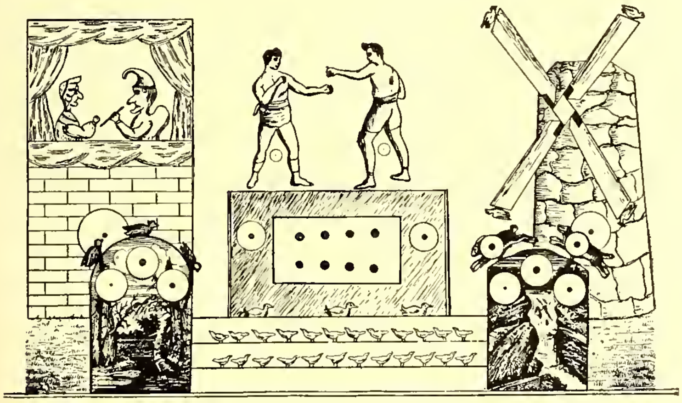
There is little room on the ground floor of the smaller tower for concessions, it being the starting and stopping place, and



THE CORDILLERO SLIDE, SHOWING TOWERS, STEEL CABLES, CARS AND ROOM FOR CONCESSIONS where all the machinery is located. The available space, however, is 22,500 sq. ft., so that the machinery of the whole park can be placed there, together with the cable hoist used for drawing the cars to the top of the higher tower. On the second floor of the smaller tower, about 22,000 sq. ft., a theater can be built, or something else along the same line. Use may also be found for the higher floors. In the larger tower the first and second floors can be left out or attractions put in them, such as a ballroom, etc., the space being the same as in the smaller tower, and the same can be used on each of the floors going up, excluding the floors on which the cars travel. If so desired, an elevator can be constructed in the higher tower if the latter is used as an observatory. The cables may be stretched over a lake or river and a Shooting the Chutes arranged, starting from one of the tower floors, thus using up space that otherwise might be lost. In fact, the possibilities of this slide are such that a whole park can be constructed from it.

COMBINATION AUTOMATIC SHOOTING GALLERY

As the profits of a park shooting gallery are dependent largely upon the attractiveness and novelty of the targets, amusement managers, no doubt, will be interested in a description of some of the excellent work done by the Quaker City Arms & Target Works, of Philadelphia, in the planning and construction of shooting galleries and appurtenances. The cut presented illustrates the company's gallery "R," known as the "Prize Fighters." This is a great achievement in target making and is bound to attract the sporting fraternity and general public. Hence it should prove to be a first-class money-maker, second to none. The central figures (which are 20 ins. high) stand in a fighting attitude, ready to box, moving toward each other and retreating alternately until the bull's-eye on either figure is hit. Then it drops down as if knocked out, recovers and is ready for the next round. Naturally it is both exciting and amusing to see a prize fight without danger of police interference. Below is a set of chimes, on which a melody can be played, with a repeating rifle. On each side are self-setting gong targets. Below are swimming ducks, which fall over when hit, as natural as life, as they move past, and are automatically re-set. On the



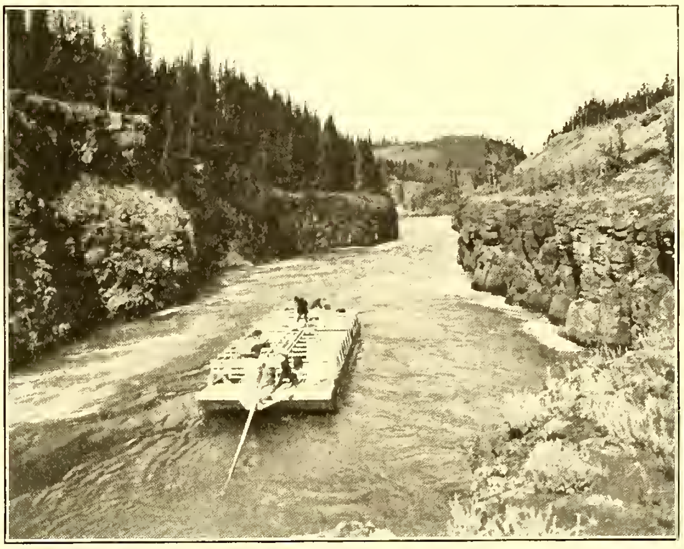
COMBINATION AUTOMATIC SHOOTING GALLERY

right is the leaping rabbit and dog, which appear and disappear, ringing a gong when the bull's-eye on the same is hit. Below are three gong targets. On the left are flying birds, which fall back when hit, while in motion, and are self-adjusting. Below these there is another set of three gong targets. In the rear of the leaping rabbit and dog stands a revolving windmill; the birds on the sails fall back when hit and are automatically reset. In the rear of the flying birds is a Punch and Judy target. Punch and Judy appear and disappear alternately and fall back temporarily when hit. Below the ducks are two rows of dropping birds, which fall to the ground when hit and are re-set by hand.

The entire gallery is kept in constant motion by either a gas or gasoline engine or electric motor. It is very simple and strong in construction, light running and not likely to get out of order. This gallery has fully sixty-five targets. It is made of heavy iron for 22-short cartridges and is nicely painted.

MOVING PICTURES

Of all the vaudeville attractions presented in a summer resort, it would be difficult to find one which retains so strong a hold on the public as moving pictures. Of course, the continued drawing power of such an exhibition depends entirely on the use of a large number of interesting subjects which can be frequently varied, but as no single park manager can afford to purchase the films outright, it is customary to hire them



TAKING PHOTOGRAPHS ON THE GREAT YUKON RIVER FOR MOVING PICTURES

from a central distributing agency. This is the class of work carried on by Miles Brothers, of New York, who not only are large manufacturers of moving picture films and complete outfits, but are also the distributers of moving picture apparatus of all other makes. Their extensive knowledge of this field enables them to rent cheaply at weekly or semi-weekly intervals a selection of the best and latest work, thereby relieving the park management of all worry and uncertainty in trying to select attractive subjects. Miles Brothers are also prepared to supply a skilled operator and apparatus wherever necessary.

Some idea of the extensive work carried out by this firm in gathering material on subjects of great human interest may be obtained by examining the accompanying illustration, which shows a party of their experts on the great Yukon River in the act of taking a series of moving pictures through Miles Cañon. Messrs. Miles also have a number of other parties throughout the world, some of which are securing films of Russo-Japanese battle scenes, the Panama Canal work, besides numerous comic and dramatic subjects.

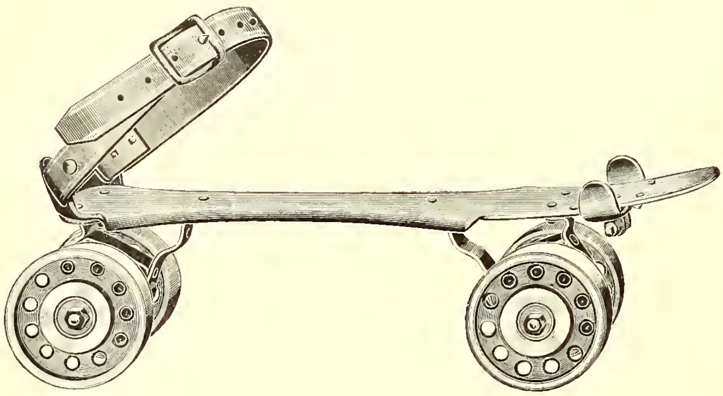
MYTH CITY, KATZENJAMMER CASTLE, TEMPLE OF MIRTH, CAVE OF THE WINDS, ETC.

The planning and construction of unique "illusion" and "laughing" buildings has been brought to a high state of development by the Continental Amusement Construction Company, of Buffalo, N. Y., which is responsible for originating some very popular attractions of this character. The illustrations on the next page show two of the company's structures, one known as "Katzenjammer Castle" and the other as the "Temple of Mirth." The former is 70 ft. x 20 ft. x 20 ft. in size, containing a number of the latest mirth-provoking devices and illusions, while the entrance itself surely is odd enough to provoke anybody's curiosity. The "Temple of Mirth" is a massive

Egyptian-like structure, 50 ft. x 20 ft. x 20 ft. in dimensions. Other products of this company are "Myth City," the "Helter-Skelter" slide, "Cave of the Winds," "Caves of Capri" and

KATZENJAMMER CASTLE

"House of Trouble." The company sells plans of all of these buildings at a low figure, and as the cost of construction is



ROLLER SKATE FOR RINK USE

also moderate, even a small park can secure in this way quite a variety of novel entertainments of this character.

HIGH-GRADE ROLLER SKATES FOR RINK USE

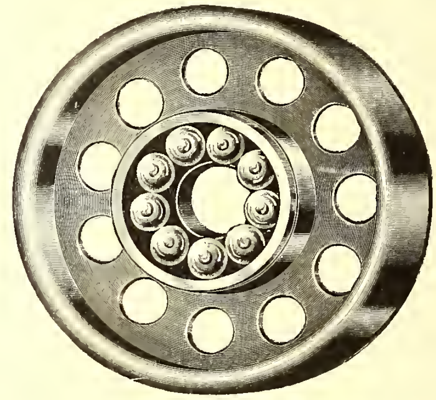
The undeniable revival of roller skating after an interval of a generation warrants more than ordinary attention to the subject of roller skates and the matters pertaining thereto. The Samuel Winslow Skate Manufacturing Company, of Worcester, Mass., was established in 1856, and has been making ice skates constantly since that time. The company has also been making roller skates since the early 70's, and claims to be the oldest ice and roller skate manufacturer in the United States.

During the last roller skate excitement previous to the present one, the Winslow Skate Company obtained a series of patents on what was then and has since been known as the "Vineyard" roller skate. The company states that the original "Vineyard" roller skate was so well devised that its fundamental principles now make the basis of roller skate construction in this country. In the best of the company's own product to-day all the strong features of the "Vineyard" skate are in evidence, although they appear under new and improved forms and in thoroughly up-to-date mechanism.

The Winslow Skate Company, in presenting its rink skates to managers of park rinks, calls attention not only to the general excellence of construction of its skates, but specifically to the high-grade material and workmanship which characterize their ball-bearing mechanism, which is the point of greatest interest to roller skaters to-day. The cones and ball cases are made from cast steel tempered in oil. The ball cases are made in two parts and milled from the bar, and being made in this way, the bearings are parallel with the outside. The cones and ball cases, after being tempered, are ground to accuracy, thereby insuring a perfect bearing.

Ball cases are apt to loosen, from various causes, and there must be some way of holding them securely to the rims. Ball cases, whether made in one or two pieces, simply forced into the rims, or even with hot metal poured around the ball case, are not safe, and at just the important time and when needed most, are apt to become loose.

The holes in the rims are perfectly true. Consequently, when the ball cases are pressed in the rims the alignment is perfect. The roll is then finished on its bearings. A key seat cut in the rim and a steel key with ends bent into a slot in the ball case prevent the ball cases from coming out or turning, and the flanges on the outside of the ball cases prevent them from going inward. By this mechanism the ball cases are made absolutely secure.



WEB STEEL ROLL

The fastest challenge speed skaters in the world are said to be using these ball-bearing skates with the best results.

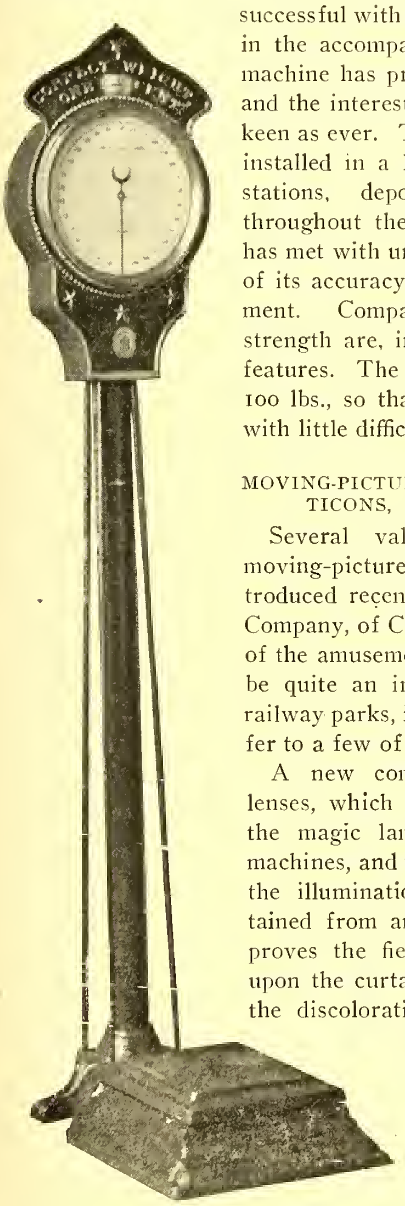
TEMPLE OF MIRTH

Nine 3-16-in. balls on each side of the roll are used, which give room for a larger cone than with the eight balls generally employed. Special attention is called to the ball retainer inside the ball case, which prevents the balls from falling through the axle hole when assembling. This is a consideration of great importance to rink managers.

Another feature to which this company calls particular attention is its "Web" steel rolls, which are so constructed and weighted as to overcome all of the difficulties which have heretofore caused annoyance to roller skate rink operators. The company maintains that its "Web" steel roll will wear longer than any other wheel ever made; that it will not slip; can be easily cleaned; that it runs true; and for these and other reasons has increased value for private ownership or for rink operators.

DIAL PLATFORM SLOT WEIGHING SCALE

The Rogers Manufacturing Company, of New York, whose souvenir post card machines were mentioned on page 485 of the Street Railway Journal of March 11, has also been very successful with the weighing scale shown in the accompanying illustration. This machine has proved lucrative for years, and the interest of the public remains as keen as ever. The Rogers scale has been installed in a large number of railroad stations, depots and ferry houses throughout the United States, where it has met with uniform success on account of its accuracy even under severe treatment. Compactness, reliability and strength are, in fact, among its leading features. The machine weighs less than 100 lbs., so that it can be moved about with little difficulty.



PLATFORM SLOT WEIGHING SCALE

MOVING-PICTURE MACHINES, STEREOPTICONS, SLIDES AND FILMS

Several valuable improvements in moving-picture appliances have been introduced recently by the Kleine Optical Company, of Chicago, and as this branch of the amusement business has grown to be quite an important factor in many railway parks, it may be of interest to refer to a few of them in detail as follows:

A new combination of condensing lenses, which can be applied to any of the magic lanterns or moving-picture machines, and which materially increases the illumination upon the curtain obtained from any form of light and improves the field by rendering the disc upon the curtain absolutely flat without the discoloration which is particularly noticeable when using the arc electric light.

A radically new method of making and storing oxygen for the production of lime light; this involves the use of a chemical which immediately generates oxygen when placed in water. The apparatus employed to utilize this chemical for projection work is very simple and absolutely safe; the gas is generated during the exhibition without the application of heat, instantaneously, at low pressure, and at no time is there a large supply necessary, generation going on while the gas is being consumed.

A new series of high-grade projection lenses for stereopticon work and moving pictures. Among these are long-distance lenses of the best grade, to project stereopticon pictures at 200 ft. or 250 ft., and an extra fine quality moving-picture lens for medium distances, say 40 ft. to 75 ft. By special arrangement with lens manufacturers of world-wide reputation, the Kleine Optical Company has unusual facilities for obtaining moving picture and stereopticon lenses of every grade, in the greatest variety. Every practical focus will be found in its stock.

A new form of vapor light, which accomplishes the same results as the "bright white" light and the "sun rival" light, but is extremely compact, uses 7 ozs. of wood alcohol when fully charged, is less expensive and operated in the most simple manner. The light generating outfit weighs 26 ozs. This is a French invention, and the company furnishes the imported apparatus.

A device which the company calls the "Deflector" is attached to the objective lens to change the direction of the rays of light; this attachment enables the operator to avoid tilting his instrument when projecting up or down.

NEW POWER HOUSE OF THE ROCHESTER, SYRACUSE & EASTERN RAILWAY

The new power house of the Rochester, Syracuse & Eastern Railway Company, now in course of construction at Lyons, N. Y., will be finished July 1. The building is to be 177 ft. long x 124 ft. wide, and from 36 ft. to 40 ft. high. It will contain three separate rooms for boilers, engines and transformers. The boiler department will be 95.4 ft. wide, the width of the engine room will be 74.8 ft., and the transformer room will be 30 ft. wide. Brick and stone are to be used in the structure. The roof will be flat and will be covered with tar and gravel. Monitors will be placed over the engine and boiler rooms. The equipment of engines and dynamos will consist of two turbogenerators of 1500 kw each. These machines will generate a current of 3300 volts, each generator to have a 50-kw exciter, mounted on a turbine shaft. There will also be two rotary converters of 500 kw each, six of 400 kw each, and twenty-four transformers with a capacity of 6500 kw. There will be installed in the main generating station a thirteen-panel switch, and in the three sub-stations switchboards of five panels each will be placed. Twelve quadruple engines of 110 hp each will constitute the motive power.

A QUESTION OF HEADWAY IN CANTON

The Canton-Akron Railway Company, of Canton, Ohio, has been having an interesting controversy with the city of Canton over the operation of cars on its city lines. E. S. Dimmock, who took charge of the property a short time ago, found that some of the lines were not paying, and he increased the interval between cars from twelve minutes to fifteen minutes. The City Council passed an ordinance requiring that all cars be operated on a twelve-minute headway. The company offered to conform to this headway if the city would allow it to increase its rate of speed from 10 m.p.h. to 15 m.p.h., which would enable it to maintain the desired headway and still reduce the number of cars as planned. This the city refused to do. The company then agreed to make a thirty-day trial of the twelve-minute headway, and offered to demonstrate practically to the city that some of the lines could not be operated profitably with this headway. A few days ago one car was taken off on one line. Next day Manager Dimmock was notified that the Mayor would take action if the twelve-minute headway was not resumed. The following day a policeman stationed for the purpose reported that cars on the line in question averaged fourteen minutes apart. The Mayor immediately issued a warrant for the arrest of Manager Dimmock, but no action was taken, as the car was put back on the line.

FINANCIAL INTELLIGENCE

WALL STREET, April 5, 1905.

The Money Market

There was no material change in the monetary situation this week. The volume of business in all departments was somewhat smaller than in the preceding week, but despite the falling off in the demands for funds, the banks and trust companies here were able to hold the market steady at near the recently quoted rates. The inquiry for accommodations was largely for call money, which advanced sharply to 4½ per cent at the beginning of the week, as a result of the preparations making for the April 1 interest and dividend disbursements. Subsequently, however, there was some pressure of funds, which carried the rate down to 3¼ per cent, at which the final transactions were made. Time money rates, however, experienced very little change. At the opening there was a fairly good demand for all maturities at 3½ per cent, but the local institutions were not disposed to put out their funds at under 3¾ per cent. Later in the week foreign bankers and out-of-town lenders offered rather liberally, and practically all of the 3½ per cent bids were accepted. This left the market in a much easier position, and although the local institutions continued to quote 3¾ per cent up to the close, they were unable to place any considerable amount of funds at that figure. Mercantile paper was moderately active. Merchants were disposed to offer more freely in connection with the spring trade, and all offerings of prime material found a ready market at 4 to 4¼ per cent. The weekly statement of the associated banks, published last Saturday, was more favorable than had been generally expected. The decrease in loans of $10,412,000 was probably due to the shifting of loans to other institutions. The actual loss in cash was $814,900, and was considerably smaller than the loss indicated by the preliminary figures. Deposits decreased $12,000,600, and the reserve required decreased $3,000,150. The surplus reserve increased $2,185,250 to $8,664,575, against $27,755,050 in the corresponding weeks of last year, $2,130,825 in 1903, $2,649,525 in 1902, $5,817,975 in 1901, and $7,904,800 in 1900. At the close indications point to a continued steady market at near the present level of rates. It is pointed out that the demand for funds from the interior has not developed large proportions, and that the money disbursed for interest and dividends on April 1 would soon find its way back to the banks, thus increasing to a great extent the lendable supply of funds. Against this, however, is the heavy demand soon to be made upon the banks for the various bond issues, notably the $100,000,000 Pennsylvania 3½ per cents, and the new Japanese Government 4½ per cents, besides a number of other less important issues. The situation at all the European financial centers continued easy, especially at London, where there is talk of a further reduction in the Bank of England's minimum discount rate in the near future. At Berlin the open market rate is 1 7-8 per cent, and at Paris the rate is 2 per cent.

The Secretary of the Treasury announces that he will call for 50 per cent of the Government funds held by the temporary depositaries, and such portion of the funds held by the permanent depositaries as they can appropriately spare in view of amount of business done by the several banks for the government, not exceeding 50 per cent; the same to be paid in two instalments; one-half on or before May 15, and the balance on or before July 1. This will yield in the aggregate about $27,000,000.

The Stock Market

Trading in the local securities market this week was upon a fairly large scale, and although prices displayed an irregular tendency at times, the general trend of values was toward a higher level. In the early dealings prices were influenced to a great extent by the higher range of values for American stocks at London and by the heavy subscription to the new Japanese loan, which was construed by many as an indication of an early settlement of hostilities in the Far East. Later the favorable report regarding the winter wheat crop, the improvement in railway gross earnings, and the encouraging reports from Western traffic managers, imparted a decidedly better feeling, and despite the flurry in the call loan rate, prices for nearly all of the prominent issues continued the upward movement. The sharp advance in Union Pacific was a conspicuous feature of the early dealings, and imparted pronounced strength to practically the entire railroad list. New York Central, Canadian Pacific, St. Paul, and many of the minor issues, advanced sharply, while in the industrial list many substantial gains were recorded. At the beginning of the present week trading developed considerable activity and strength on the favorable showing made by Saturday's bank statement, and the reports of continued industrial activity throughout the country. On Monday afternoon, however, the market reacted sharply from the top prices on selling by traders, who evidently misunderstood the written opinion in the Northern Securities case. The losses, however, were soon recovered. On Tuesday, trading quieted down considerably. The passage of the Stock Transfer Tax and the Mortgage Tax bills, at Albany, chilled bullish sentiment, and prices generally developed a reactionary tendency. A feature of the late dealings was the activity and strength in the Southern iron and steel issues, especially in Tennessee Coal & Iron and Sloss-Sheffield, on rumors of renewed progress in the Southern iron merger. The market closed heavy.

The local trading stocks were only moderately active, but prices generally showed substantial gains over those prevailing at the close of last week.

Philadelphia

Trading in the local market for traction stocks was on a fairly large scale this week, and although the dealings were attended with more or less irregularity in prices, the under tone was generally strong. In the early trading prices were inclined to sag in sympathy with the decline in other quarters of the market, but toward the close the market developed considerable activity and strength, several issues making new high record prices. Strength was pronounced in the speculative issues. Philadelphia Electric and United Gas & Improvement common were conspicuously active and strong in the early part of the week, on the report that the first named company was to be leased to the United Gas & Improvement, and despite the subsequent denial of the rumor prices for both issues reacted only fractionally. Philadelphia Electric opened at 11⅛ and advanced to 12, and closed at 11¾. About 25,000 shares were dealt in. United Gas & Improvement declined from 116¼ at the opening to 115¼, but later there was a sharp advance to 118⅛ on rather heavy purchases. Considerable realizing developed at the high figure, and carried the price off about a point. Subsequently there was another upward movement, the stock selling at 117¾, ex the dividend, but at the close there was a reaction to 117. Upwards of 19,000 shares changed hands. Philadelphia Company common was another active issue, about 16,000 shares changing hands, at prices ranging from 48⅛ to 46¾, and closing at 47⅛, ex dividend. Odd lots of the preferred brought 48¼ to 49. Philadelphia Rapid Transit was decidedly strong, 16,000 shares selling at prices ranging from 29¾ to 31⅜, and closing at the highest. In the less active issues pronounced strength was exhibited in Consolidated Traction of New Jersey and Union Traction, both issues establishing new high record prices at 83⅞ and 59⅞, respectively, American Railways advanced from 52 to 54¼, the latter price being the highest attained since 1892. Other transactions included small amounts of Philadelphia Traction at 99⅞ to 100, an odd lot of Union Passenger Railway at 236½.

Chicago

Despite the recent development in the franchise matter the new management of the Chicago City Railway is going ahead with the various improvements planned some time ago. Vice-President Mitten has been authorized to purchase 200 new cars, to cost $6,000 each, for use on the cross-town lines. A great many changes in the method of handling traffic have been worked out, and it is said that many reforms will be introduced during the summer. It is also said on good authority that the gross earnings for the month of March, being the first under the new management, showed a substantial increase, and although no figures are obtainable, it is understood that the percentage of increase was the largest for that month in the history of the company. It is believed that with adequate car equipment and power further substantial gains in earnings will be realized. The market for street railway shares was extremely quiet, and prices show only slight changes compared with those ruling at the close of a week ago. Chicago Union Traction sold at 10⅜ for a small amount, and the preferred brought 39¾. Chicago & Oak Park Elevated sold at 6, and the preferred at 20. Other transactions included Metropolitan Elevated at 23 to 22½, preferred at 63, South Side Elevated at 95, and Northwestern Elevated at 23.

Other Traction Securities

Dealings in the Baltimore market were comparatively quiet, but prices held generally firm. Interest centered almost entirely in the United Railway issues, all of which were moderately active. In the early trading prices displayed an advancing tendency, but subsequently prices yielded fractionally on the opinion by Judge Storkbridge that public franchises in the streets are liable to taxation. The stock sold from 15¼ to 14¾, closing at the lowest. The income bonds ran off from 65 to 64½, but recovered, and closed at 65. The 4 per cent bonds changed hands at from 93½ to 92⅝, and back to 97⅞. About $110,000 of the incomes, and about $40,000 of the 4s, were traded in. Other sales included $4,000 Macon Railway & Light 5s at 99, $4,000 Washnigton City & Suburban 5s at 104¾, $5,000 Charleston Consolidated Railway Electric 5s at 96 to 95½, and Metropolitan Railway of Washington bonds at 119½.

The feature of the Boston market was the activity and strength in Massachusetts Electric common and preferred, the first named advancing from 20¾ to 23 on the exchange of about 9000 shares, while the preferred rose from 68½ to 70 on the purchase of 3500 shares. There was no news to explain the strength in these issues. Boston & Worcester stocks were considerably less active and irregular. The common was dealt in to the extent of several hundred shares at from 25 to 24, a loss of nearly a point, while the preferred advanced from 78⅝ to 80, and closing at 79⅞. West End common sold at 97 to 97½, and the preferred at 116 to 116½.

Interborough Rapid Transit was a strong feature on the New York "Curb." At the opening the price declined a point to 201, but subsequently there was a gradual advance to 213, at which price it closed, a net gain for the week of 11 points. Comparatively little stock came out on the advance. About 7000 shares of stock were dealt in.

New Orleans Railway new common and preferred stocks, "when issued," developed considerable activity and strength, the common 1⅜ points to 28½ on the purchase of about 2000 shares, while the preferred moved from 73 to 77¾ on light purchases. Very little business was transacted in the bond department. Public Service Corporation 5 per cent notes sold to the extent of $50,000 at 98 flat. Washington Electric 4s sold at 89⅝.

Cincinnati Street Railway was active at Cincinnati, about 2600 shares selling at 148 to 149½. Detroit United advanced from 81½ to 85. Toledo Railway & Light moved up from 31¾ to 36, on announcement of 2 per cent dividend. Cincinnati, Dayton & Toledo advanced to 21, on announcement of the success of the leasing plan. Cincinnati, Newport & Covington preferred sold at 92½ to 93, and the common at 31.

Northern Ohio Traction & Light had a phenomenal run at Cleveland. It had been selling at 18½ for weeks, and advanced to 23½ on sales aggregating less than 500 shares. Western Ohio receipts advanced from 14 to 16¼, on announcement of the financial plan for the extension which is outlined in another column. Northern Texas Traction advanced to 54⅞, and at the opening of this week there were numerous sales for 30-day delivery at 57 to 59½. Aurora, Elgin & Chicago made a good gain on reports of increased earnings, due to the opening of the line into Chicago. It sold a short time ago at 10, and advanced to 17; since then it has eased off somewhat and sold at 30-day future delivery at 14½. Cleveland Electric has advanced to 85 on small sales. Muncie, Hartford & Ft. Wayne advanced to 45.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with two weeks ago:

	March 22	April 5
American Railways	52¼	54
Boston Elevated	154½	154½
Brooklyn Rapid Transit	66⅝	67½
Chicago City	a199	199
Chicago Union Traction (common)	9¾	10
Chicago Union Traction (preferred)	a45	42
Cleveland Electric	82½	82½
Consolidated Traction of New Jersey	81	81
Consolidated Traction of New Jersey 5s	110¼	110¼
Detroit United	81¼	85¼
Interborough Rapid Transit	201¼	212¾
International Traction of Buffalo	28	29½
International Traction of Buffalo (preferred)	68	69
International Traction of Buffalo 4s	82½	82½
Manhattan Railway	167¼	166½
Massachusetts Electric Cos. (common)	20¾	21¾
Massachusetts Electric Cos. (preferred)	67	69
Metropolitan Elevated, Chicago (common)	23	23
Metropolitan Elevated, Chicago (preferred)	63	63
Metropolitan Street	122¼	122⅞
Metropolitan Securities	86¾	87⅜
New Orleans Railways (common) inc	27¼	27¾
New Orleans Railways (preferred) inc	72½	77
New Orleans Railways, 4½s	84½	—
North American	100⅝	102⅞
North Jersey Street Railway	23	23
Philadelphia Company (common)	47⅜	*47
Philadelphia Rapid Transit	29½	31¼
Philadelphia Traction	99¾	100
Public Service Corporation 5 per cent notes	97¾	97¾
Public Service Corporation certificates	72½	72½
South Side Elevated (Chicago)	95	—
Third Avenue	129	130
Twin City, Minneapolis (common)	113⅜	120½
Union Traction (Philadelphia)	58⅞	59⅛
West End (common)	97½	97¼
West End (preferred)	116	116

a Asked. * Ex-div.

Iron and Steel

The "Iron Age" says that the tonnage booked by the steel companies throughout the country is enormous, the total of the United States Steel Corporation being now the largest on record. In some branches the congestion is such that an effort has been made to purchase material in the open market. It is reported that the Steel Corporation has endeavored to buy 50,000 tons from outside plate makers, without success. The market is pretty bare of pig iron for steel making. The total amount of foreign bessemer pig bought by a tidewater works was 30,000 tons, which covers sales of rails made to South America. Reports from the structural trade are encouraging. The leading interest has about 600,000 tons on the books, and specifications are coming in more freely.

TOLEDO BONDS SOLD

E. W. Moore, of the Everett-Moore syndicate, has sold an additional $250,000 of Toledo Railway & Light 4s to a New York bond house, and has given an option on the remaining $334,000 now in the treasury at 30 days. This makes $500,000 of these bonds sold during the past month. It is believed the balance will be sold in the time stated. This will give the Toledo Company sufficient money to pay its entire floating debt, and leave a reasonable sum on the treasury to take care of improvements this summer. It is estimated that the property will earn 3½ per cent on its stock this year. It has already been placed on a 2 per cent dividend basis. It is the intention to pay a 1 per cent dividend this spring, and 1 per cent in the fall.

INCREASE IN NEW YORK CITY FRANCHISE VALUES BY STATE BOARD

The State Board of Tax Commissioners has made public the franchise valuations it has fixed for New York City corporations for the year 1905. The valuations for 1904 were $251,158,450, and the valuations for 1905 are $302,193,550, showing an increase for the greater city of over $50,000,000.

The valuation of the Manhattan Railway Company has been increased from $46,700,000 to $55,750,000; Brooklyn Rapid Transit Company from $25,552,000 to $29,560,000; New York City Railway system from $74,860,000 to $79,233,000; Brooklyn City & Newtown Railroad Company from $1,294,000 to $1,730,000; Coney Island & Brooklyn Railroad from $895,000 to $1,170,000; Long Island Electric Railway from $182,000 to $201,000.

POWER-STATION EQUIPMENT FOR SALE

John A. Stewart, of Cincinnati, has purchased the equipment of the Louisiana Street power station of the Indianapolis Traction & Terminal Company, of Indianapolis, consisting of 1000-hp of boilers, 650-kw G. E. and Westinghouse generators, and 1500-hp of Wheelock engines. These are being offered for sale, as they must be moved at once to make way for improvements.

ANNUAL REPORT OF TWIN CITY RAPID TRANSIT COMPANY

The official report of the Twin City Rapid Transit Company for the year ending Dec. 31, 1904, has just been issued. The gross earnings were the largest in the company's history, but net fell somewhat below those for 1903, due to a change in accounting whereby there were added to operation $206,400 for renewal funds and $31,394 for insurance fund. Had these items not been covered in operating expense the surplus for the common stock after payment of the preferred dividend would have been $1,266,374, or 7.67 per cent instead of the $1,028,581 or 6.23 per cent shown. Thus on the basis of accounting used in former years the rate of dividend earned on the common is the highest in the company's history, being 7.67 per cent compared with 7.25 per cent in 1903, 7.06 per cent in 1902, 5.87 per cent in 1901, and 4.7 per cent in 1900. The remarks of President Lowry in regard to the arrangements with the city of St. Paul on franchises are interesting. He says the company deems this decision and settlement of immeasurable advantage. The following figures have been abstracted from the report:

Statement of receipts and expenditures, 1904.

RECEIPTS	
Passenger earnings	$4,269,408
Miscellaneous	38,672
Total earnings	$4,308,080
EXPENSES	
Maintenance of way and structures	$196,520
Maintenance of equipment	291,705
Operation of power plants	387,571
Car service	867,319
General expense	184,189
Legal expense	22,999
Injuries and damages	165,001
Insurance	16,605
Insurance fund	31,395
Total operating	$2,163,304
Net earnings from operation	$2,144,776
Interest on debt and taxes	$906,195
Surplus applicable to dividends	$1,238,580
Dividends preferred stock	$210,000
Dividends common stock	825,550
Total dividends	$1,035,550
Income account, surplus	$203,030
Per cent total operating (including taxes) to total earnings	55

Note:—But for the transfer of $206,268 to renewal funds and $31,394 to insurance fund, as explained in the report, the surplus for the year would have been $440,694, as compared with $419,296 for year 1903.

General balance sheet, December 31, 1904.

RESOURCES			
Roadway, equipment, real estate, buildings machinery, tools and securities in treasury			$35,230,714
Surplus December 31, 1903		$3,410,642	
Less taxes unpaid,	$280,290		
Less injuries and damages	50,000	330,290	3,080,352
			$32,150,361
Additions during year 1904			2,250,224
			$34,400,586
Current assets			629,402
Notes and accounts receivable		29,737	
Cash in banks		393,264	
Construction material for current improvements		206,400	
Stores, materials and supplies			141,068
Invested funds			81,394
Insurance funds		$31,394	
Renewal funds		50,000	
			$35,252,451

LIABILITIES		
Capital stock		$19,511,000
Common stock	$16,511,000	
Preferred stock	3,000,000	
Funded debt		14,386,000
Minneapolis Street Ry. Co.	$4,998,000	
The St. Paul City Ry. Co.	4,388,000	
Mpls. & St. Paul Sub. Ry. Co.	500,000	
General mortgage 5 per cent	990,00	
Consol. mortgage 5 per cent	3,510.000	
Current liabilities		861,892
Unpaid vouchers and accounts	$82,266	
Interest accrued and not due	252,033	
Dividends common stock due and payable February 15, 1905	206,387	
Taxes accrued and not due	321,205	
Reserve funds		84,259
Insurance	$31,394	
Injuries and damages	52,864	
Renewal funds		206,268
Way and structure	$81,258	
Equipment	125,000	
Income account, surplus		203,030
		$35,252,451

Minneapolis Street Railway Company.

Statement of funded debt, January 1, 1905.

BONDS	
First mortgage, 7 per cent, due 1910	$190,000
Second mortgage, 6 per cent, due 1913	600,000
First cons. mortgage, 5 per cent, due 1919	4,208,000
	$4,998,000
The St. Paul City Railway Company.	
First Mortgage, 6 per cent, due 1932	$224,000
First cons. mortgage, 6 per cent, due 1934	456,000
Cable cons. mortgage, 5 per cent, due 1937	3,708,000
	$4,388,000
Minneapolis & St. Paul Suburban Railway Company.	
First mortgage, 5 per cent, due 1824	$500,000
Minneapolis Street Railway Company and the St. Paul City Railway Company.	
General mortgage, 5 per cent, due 1911	$990,000
Consol. mortgage, 5 per cent, due 1928	3.510,000
Total	$14,386,000

MUNICIPAL OWNERSHIP IN MICHIGAN

The Legislature of the State of Michigan has refused by a very decided vote to submit to the people a proposition to amend the constitution of the State so as to provide for the municipal ownership of street railway lines. While the proposed amendment would of necessity apply to the entire State, it was introduced by a member of the legislature from the city of Detroit, and was understood to mean that the people of that city would be given an opportunity to vote upon the question of the purchase and operation by the city of the street railway line in the city now owned and operated by the Detroit United Railway.

Since the action of the legislature in refusing to submit the question to a vote of the people, an opinion has been given by the corporation counsel of Detroit to the effect that no amendment of the constitution is necessary to effect municipal ownership, as the city has a right under the present constitution and laws of the State to own street railway lines. Numerous court decisions are quoted in support of this position, one of them being from the case recently decided where the Common Council of the city attempted to compel the Detroit United Railway to repair the foundation under its tracks in one of the city streets.

Acting under this opinion and several others of a similar nature, the corporation counsel expresses the belief that the city has a right to construct and own street railway lines in the city, and it is proposed that an experimental case be tried, the city to construct a line in some street in the city, with the intention and expectation of bringing the entire matter to some definite conclusion by such action.

On March 28 the Common Council adopted a resolution looking to municipal ownership, for a resolution was introduced in Council directing the commissioner of public works to submit a supplemental estimate calling for an appropriation of a small sum to build a short stretch of line to be leased to the Detroit United Railway.

THE GRAND RAPIDS-KALAMAZOO CONTRACT

The contract for equipping the Grand Rapids & Kalamazoo Railway, to which reference was made in the Street Railway Journal of April 1, provides for the installation of the Westinghouse single-phase system. The road will be built from Grand Rapids to Kalamazoo with a branch from Otsego to Allegan, and from Shelbyville to Gun Lake, and will be about 60 miles long. Twelve passenger cars, to be geared for high speed, and six fast express cars have been ordered. The road will use the city lines of the Michigan Traction Company for a terminal in Kalamazoo. The location of the central power house is not even intimated in the information to hand.

The board of directors consists of W. H. Patterson and Frank Henry, of Kalamazoo; E. J. Anderson, of Plainfield; C. B. Kelsey, president of the Commercial Savings Bank, of Grand Rapids, and George Hefferan, secretary of the Michigan Trust Company, of Grand Rapids. The company is financed by Eastern capital, funded on a 30-year bond issue of $1,600,000, secured by a mortgage. Ex-Senator John J. Patterson, of Philadelphia, who is chief promoter of the company, has been elected president of the Michigan Construction Company, specially organized to take charge of the construction of the road.

FINAL HEARING ON BOSTON-PROVIDENCE PROPOSITIONS

The final legislative committee hearing on the various interurban railway plans to connect Boston and Providence was held at Boston on March 28. Hon. S. L. Powers, representing the so-called Gaston-Shaw line, offered a substitute bill limiting the road's right to sell electricity for power purposes; modifying freight privileges by providing for the handling of express matter only; making the local authorities the deciding power in reference to highway crossings; adding the right to make traffic agreements, and leaving the eminent domain clause in the original bill about the same. The new draft also gave the company the right to sell real estate not required for its own purposes, and increased the capital stock from $2,000,000 to $2,500,000. Mr. Powers stated that it was the opinion of his clients that the Stone & Webster line, running in highways to a great extent and including grades as severe as 9 per cent, would never be in competition with their line, because the latter would run over a private roadbed outside the highways, and the grades would be slight. Regarding competition at the northerly end, where the Stone & Webster line—the Blue Hill Street Railway—is already in operation, he felt that if the new line could save time from Canton and Stoughton into Boston it would draw the through traffic, but the existing lines would have their local business developed in taking passengers to connecting points of the new line. He also said that his road would bear all the expense of eliminating all grade crossings, subject to the desire of local authorities—a thing which no steam railway has or is willing to do—and that if new streets were built across the line in the future, the company would bear the expense of separating the grades.

Mr. Powers presented an estimate of the cost of his road—the Boston & Providence Street Railway. The general features of this line were described on page 571, Street Railway Journal, March 25, together with the main facts pertaining to the Chapman and the Stone & Webster proportions. The estimate presented by Mr. Powers follows:

BOSTON & PROVIDENCE STREET RAILWAY COMPANY—ESTIMATE OF COST OF CONSTRUCTION

80-lb. rail—double main line, cross-overs, car house connections—64 miles—8046 tons, at $30.40	$244,598
Distributing rails along line, 8046 tons, at $1.50	12,069
22,528 joints, at $1.65	37,171
2048 kegs of spikes, at $4.50	9,216
22,528 short bonds, at 35c	7,885
22,528 long bonds, at 60c	13,517
710 cross bonds, at 90c	639
183,000 ties, at 50c., distributed along line	91,500
150 tons 80-lb. guard-rails on bridges, at $30.40	4,560
Distributing same, at $1.50 per ton	225
Labor, laying 64 miles of track, at 20c. per foot	67,584
Ballast, 138,375 cu. yds., at 40c	55,350
Overhead work, iron-pole construction, 31½ miles, at $8,000	252,000
40 cars, at $12,000	480,000
8 double-truck snow-plows, at $5,500	44,000
Power house and electrical equipment	475,000
Car house, with addition for office	32,000
Telephone service	2,500
	$1,829,814
Clearing and grubbing, 206 acres, at $90	$18,540
Avoiding twenty-eight grade crossings, at $7,800 each	218,400
Earthwork, 850,000 cu. yds., at 30c	255,000
Solid rock excavation, 50,000 cu. yds., at $1.65	82,500
Stone or concrete, 7020 cu. yds., at $7.50	52,650
Steel work	40,000
Drain-pipe culverts, 4000 ft., at $2	8,000
Special work, frogs and switches	15,000
Fencing, 63 miles, at $330	20,790
Cattle-guards	200
Cattle passes, under or over	4,000
Highway fencing, State highway construction	9,216
Incidental woodwork, coffer dams, false work, etc	2,500
	$2,556,610
Ten per cent	255,661
	$2,812,271

Following Mr. Powers, various remonstrants were heard. The main objection urged by citizens was that the proposed routes have not as yet been definitely settled, and that any right of eminent domain granted before the definite route had been published, or before persons whose lands had been affected should have a chance to be heard, would be unfair and contrary to the policy of the commonwealth. The steam railroad attorneys present, W. H. Coolidge, of the Boston & Maine, and M. A. Maxwell, of the New Haven, based their opposition on the plea that if a new company should be allowed to do a railroad business, it should be subject to the burdens and safeguards imposed on steam railroads, and existing steam roads should be given a fair chance to build the line if they saw fit. H. C. Forbes, representing parties wishing to build under the steam railroad law, spoke briefly in favor of his clients.

The estimate presented by the Stone & Webster attorney, H. H. Newton, for a so-called moderately high-speed line was as follows:

MASSACHUSETTS & RHODE ISLAND STREET RAILWAY

Approximate estimate cost of construction, mechanical and electrical equipment and rolling stock, Massachusetts & Rhode Island Street Railway and extension of Blue Hill Street Railway, completing second track of the Blue Hill Street Railway.

DISTANCES: DUDLEY STREET TO PROVIDENCE

	Miles
Elevated surface track, about	4.5
Blue Hill Street Railway track, about	10.0
Massachusetts & Rhode Island Street Railway track, about	22.0
Interstate Railway track, about	5.0
Total, about	41.5

Road to be double-track, center-pole construction, 70-lb. T-rail, oak or chestnut ties.

MASSACHUSETTS & RHODE ISLAND STREET RAILWAY, EXTENSION OF BLUE HILL STREET RAILWAY

Rail, 4840 tons, at $32	$154,880
Rail joints, 15,600, at $1.90	29,640
Spikes, 220,000 lbs., at 2½c	5,500
Cross ties, 115,000, at 50c	55,750
Track laying and surfacing, 22 miles, at $1800	39,600
Ballast, 132,000 cu. yds., at 80c	105,600
Copper bonds, 31,200, at 50c	15,600
	$406,570
Overhead construction, 22 miles double track, at $6,000	132,000
20 double-truck cars, semi-convertible, four motors, at $8,500	170,000
5 snow-plows complete, at $5,500	27,500
Extension to power house, mechanical and electrical equipment	200,000
Car house	20,000
Grading, masonry, etc., 22 miles, at $20,000	440,000
Land for right of way, 22 miles, at $1,000	22,000
Engineering, superintending, legal and incidental, 10 per cent	141,807
Total estimate of proposed extension	$1,559,877

SECOND TRACK, BLUE HILL STREET RAILWAY

Rail, 660 tons, at $32	$21,120
Joints, 2000, at $1.90	3,800
Spikes, 30,000 lbs., at 2½c	750
Cross ties, 16,220, at 50c	8,110
Track laying and surfacing, 6 miles, at $900	5,400
Ballast, 18,000 cu. yds., at 80c	14,400
Copper bonds, 4000, at 50c	2,000
Overhead construction, 6 miles, at $3,000	1,800
Grading, masonry, etc., 6 miles, at $3,000	18,000
Damages	10,000
Engineering, superintending, legal and incidental, 10 per cent	10,158
Total estimate of proposed second track	$111,738
Present value main line, Blue Hill Street Railway	450,000
Total estimated cost, double-track line, Mattapan to Rhode Island line	$2,121,615
Average cost per mile of double track	$66,300

CHICAGO ASKS BIDS FOR A MUNICIPAL STREET RAILWAY

The local transportation committee of the Chicago City Council has given Mayor Harrison authority to advertise for bids for the construction of a municipal street railway on streets where the franchises owned by the Chicago Passenger Railway may have expired. Lines on these streets are at present operated by the Chicago Union Traction Company. The bidders will be asked to submit bids which will offer one of two alternatives—city ownership and city operation or city ownership and company operation. The committee has engaged Bion J. Arnold to draw up detailed plans for the system proposed. Bids are to opened July 1, 1905. The advertisement in part reads as follows:

Proposals will be received for the construction and installation of a system of municipal street railways within the city of Chicago, upon the terms and conditions and the alternative plans hereinafter stated:

First—The said street railway system will first be installed upon the following-named streets and parts of streets, to wit:

Adams Street, from Clark to Desplaines.

Desplaines Street, from Adams to Harrison.

Harrison Street, from Desplaines to Western Avenue.

Western Avenue, from Harrison to Twelfth Street.

Twelfth Street, from Western to Crawford Avenue.

It next will be extended over the following streets and parts of streets, upon which the rights of the present occupants already have expired:

Halsted Street, from Harrison street south to the center of the Chicago River. Ogden Avenue, from Harrison Street to Fortieth Avenue, and will, at the pleasure of the City Council, be extended into any and every other part of the city of Chicago upon streets in which the rights of the present occupants have already expired or will expire during the years 1905 and 1906, and upon such other streets as may, in the discretion of the City Council, be deemed advisable for making connected routes and lines of street railways.

Payments to be made by the city shall be made either by the delivery of street railway certificates to be issued under and in accordance with the provisions of an act of the General Assembly of Illinois, entitled "an act to authorize cities to acquire, construct, own, operate and lease street railways and to provide the means therefor," commonly known as the Mueller law, or in cash from the proceeds of the sale of such street railway certificates by the city, and separate bids may be submitted for payment by said certificates or for payment in cash from the proceeds of the sale thereof.

If the bidder so elect, bids may be submitted upon the basis that the completed system, when equipped and installed, shall be so leased to such bidder, and in case he shall submit with his bid the percentage of the gross receipts of the system or the amount of cash per year and the term of years, not to exceed twenty, which shall be provided for in such lease, the person bidding the highest percentage of gross receipts, other things being equal, shall be considered the highest bidder. In case of bids based upon a percentage of the gross receipts, other things being equal, the bidder who shall accept the lease for the shortest period shall be considered the highest bidder.

Bids may also be submitted for the privilege of constructing and operating street railway tracks and a system of cars in the various streets herein referred to, and such other streets as the city may lawfully designate from time to time, and in such case the bidder who agrees to pay for such privilege the highest percentage of the gross receipts to be received from such operation for the shortest term, shall, other things being equal, be considered the highest bidder. In such case the bidder may specify the streets and parts of streets upon which he desires to bid.

ANNUAL MEETING OF IOWA STREET & INTERURBAN RAILWAY ASSOCIATION

The second annual convention of the Iowa Street & Interurban Railway Association is to be held at Dubuque, Ia., on Thursday and Friday, April 20 and 21. The headquarters of the association are to be at the Hotel Julien. The session will be called to order at 10 a. m., April 20. J. L. Lindsay, secretary and treasurer of the Union Electric Company, of Dubuque, will make the address of welcome. Geo. B. Hippe, of Des Moines, Ia., the president of the association, will then speak. After the report of the secretary and treasurer has been read, H. H. Polk, president of the Interurban Railway Company, of Des Moines, will read a paper entitled "Handling Freight by Interurbans and Interchange of Business with Steam Railroads." In the afternoon the delegates will attend in a body the session of the Iowa Electrical Association and hear a paper on "Steam Turbines," by W. E. Boileau, and a visit will be made to the power house of the Union Electric Company. This is a new steam turbine plant of much interest. Plans of it have already been published in the STREET RAILWAY JOURNAL. Friday morning three papers will be read. They are entitled: "Accounting as an Aid to the Operating Department," by R. A. Tenssler, secretary of the Omaha & Council Bluffs Street Railway; "Car Shop Methods," by John D. Fish, master mechanic of the Tri-City Methods," by John D. Fish, master mechanic of the F. McDonald, purchasing agent of the Waterloo, Cedar Falls & Northern Railway Company, of Waterloo. The first business for the afternoon session will be the reading of a paper entitled "The Adoption of Gasoline Motors for Street and Interurban Service," which is as yet unassigned. After the election of officers and the selection of a place for the 1906 meeting, the convention will adjourn. The officers of the association are: Geo. B. Hippe, of Des Moines, president; James F. Lardner, of Davenport, vice-president; L. D. Mathes, of Dubuque, secretary and treasurer.

THE BROOKLYN RAPID TRANSIT ENTERTAINMENT

The entertainment provided last week at its East New York building by the Brooklyn Rapid Transit Employees' Benefit Association, for its members and their friends, proved very successful. As stated last week, each employee was entitled to two tickets, which included transportation over the various lines of the company to and from the entertainment. The professional talent, especially engaged for the entire week, played each evening to a crowded house, and on Saturday afternoon at the special matinee entertained more than 1900 children. One of the important features of this matinee was a contest between a representative girl and a boy from each of the depots. The girls' contest was among fourteen children between the ages of seven and twelve years. It was a shoe-tying competition, and the prize was a handsome pair of ball-bearing roller skates. A similar prize was awarded in the boys' contest. Figures for the evening attendance show that the lowest, that of Tuesday night, was upwards of 900. On Monday there were 1304 persons present, on Wednesday 1313, Thursday 1485, Friday 1054, and Saturday upwards of 1000.

The large attendance on Thursday evening is mainly accounted for by the fact that, on that evening the officers of the company were made the guests of the association. From the president down, all the operating officials were invited, and they availed themselves of the invitation, too. George R. Folds, assistant to Vice-President and General Manager Calderwood, was there as the personal representative of that official. Dow S. Smith, the general superintendent, was also in attendance. Others who were there were W. B. Graham, superintendent of surface lines; W. O. Wood, superintendent of elevated lines; F. D. Valentine, superintendent of employment, and the many division superintendents.

In honor of these officials the regular programme was varied somewhat. A special feature was the appearance of the Brooklyn Rapid Transit Employees Benefit Association Band of thirty pieces, which rendered several selections. This band is under the direction of W. S. Mygrant, band master of the 13th Regiment Band N. G. N. Y. Mr. Mygrant, who is one of the foremost cornetists in this country, also rendered several selections, accompanied on the piano by his daughter. Mr. Wolfram, of the entertainment committee, before permitting the regular programme to be resumed, invited the enrollment in the band of employees from all branches of the system, stating that instruments and uniforms, as well as instruction, are furnished free by the association. The band was organized last October, and since then has made remarkable progress. Already engagements are being made by it for playing at affairs other than those given by the company.

Following the entertainment the guests were invited to the classroom on the second floor, where an excellent course dinner was served to upwards of fifty guests. This room was tastefully decorated with American flags and palms, and a special arrangement of red and white incandescent lamps, the suggestion of Mr. Edwards, lent greatly to the general effect.

Vice-President Wolfram of the association extended a hearty welcome to the guests, and in behalf of the association asknowledged its indebtedness to the company officials for their good will and support, and said he hoped the good will between the company and its employees would always continue. He complimented Geo. W. Edwards, the secretary of the association, on his able management of its affairs. After dinner, Dow S. Smith, the general superintendent, introduced Mr. Folds, assistant to Mr. Calderwood, who told several good stories to illustrate a point he was making, and assured those present of the interests of the management in the work of the association.

This is the last social affair of the association before the opening by it of Luna Park, Coney Island. Through the generosity of Thompson & Dundy, proprietors of Luna Park, the association is allowed a commission on its sale of tickets for the opening and closing weeks at that resort, and to aid the association Thompson & Dundy, during these festivals, offer a coupon ticket giving $1. worth of attractions for 50 cents. The net income of the association from the sale of these tickets is used for educational purposes during the winter, and to aid cases of distress among members, and also for an occasional social feature.

An idea of the excellent work done by the association as a benevolent organization is given by the abstract made in the STREET RAILWAY JOURNAL of March 18, of the report of the secretary for the year ending Feb. 28, 1905.

CHICAGO CITY RAILWAY ORDERS TWO HUNDRED CARS

The Chicago City Railway Company last week placed an order for two hundred new cars with the J. G. Brill Company, of Philadelphia. The cars are to be delivered in June, and will be placed on the Indiana Avenue and Sixty-Third Street lines. An expert examination of the company's entire system including rolling stock, car houses and power houses, is being made, and many improvements and additions will be pushed forward, so that in a short time the service will be such as will satisfy the highest expectations, and, at the same time, the lines will be operated in the most economical manner possible. The company is proceeding with these improvements without regard to what may be obtained from the City Council in the future in the way of franchises or grants. The engineering firm of Ford, Bacon & Davis, of New York, has been retained for the expert work in connection with the examination of properties and improvements with headquarters in offices adjoining those of Vice-President T. E. Mitten, under whose personal supervision the work will be carried forward.

The new cars, which are to be of the semi-convertible type, measure 32 ft. 5 ins. over the body, are 8 ft. 10 ins. wide over the posts at belt, and have 6 ft. 2-in. platforms. They are to have several novel features, one of which is that though the windows are of the semi-convertible type, which admit of the window spaces being entirely cleared of ashes at the discretion of passengers, yet are of the arched-type, twin arrangement, with a pair of sashes which are raised into pockets in the side-roofs. This is the first time that semi-convertible cars have been ordered with the twin window arrangement. With eleven windows to each side, the added window is provided for by a triple window at the center. The sash styles are to be of bronze, so arranged that the glass may be replaced in the same manner as with the ordinary wooden sash. Another novel feature will consist of an arrangement of platform steps, devised by the railway company, in which the steps are united under the platform timbers by metal bars which slide in stirrups and are operated by a lever situated upon the platform. One movement of the lever draws back the step on one side under the platform and at the same time projects the step on the other side into its place, thus preventing persons from standing on the step on the closed side of the platform. The platforms at either end will be provided with these movable steps. Passengers also will be prevented from gaining a foothold on the bumpers by inclined metal sheathing extending from the edge of the bumper to the dasher. Longitudinal seats accommodating four passengers each will be placed at the corners of the cars to increase the aisle width near the doors and prevent crowding at these points. The other seats will be placed transversely to the car and will be 36 in. long and the aisle wide enough to permit two passengers to pass each other conveniently. The cars are to be richly finished in mahogany, and the trim will be of oxidized bronze.

The contract for the trucks to go under these cars, and ten extra trucks for use as a repair shop reserve, was let to the McGuire-Cummings Manufacturing Company, of Chicago. The trucks, of which there are to be 424, will be on M. C. B. lines.

The Consolidated Car Heating Company received an order for 8920 electric heaters. Each of the two hundred new cars will have 12 truss-plank heaters and 8 panel heaters. The order also includes 12 truss-plank heaters and 12 panel heaters for each of 205 of the older cars.

ALLIS-CHALMERS REMOVES HEADQUARTERS TO MILWAUKEE

The Allis-Chalmers Company is removing its general offices from Chicago to Milwaukee. This is another step in the direction of carrying out the plans of the present administration, which are gradually being brought to completion. One of the first conclusions arrived at by President Warren, after assuming office a year ago, was that for every reason connected with efficient administration of all branches of the work, from designing to manufacturing, and from selling to collecting and accounting, the chief offices of the company, covering all the ramifications of its business, should be concentrated in one place. That place was logically Milwaukee, because, although the company has four other works in three other cities, the largest works are in Milwaukee, and Milwaukee is where all the future expansion of the company's operations will take place. Besides, at the Milwaukee suburb of West Allis it has the land to build upon.

Instead of handling the several departments at long range, as under the old system, they will all be concentrated in one place, thus eliminating the necessity for constant traveling to and fro, effecting a great saving in time and expense, an enormous reduction in correspondence, and, above all, the quickening of all movements of production. Only by concentration at the strategic point can the results that have been aimed at by the president be accomplished. Plans for the workshop extensions at West Allis, which involve the construction of several more units, are practically complete, and the extensions will be made in due course.

ADDITIONAL POWER EQUIPMENT FOR CLEVELAND

The Cleveland Electric Railway Company is planning to increase the size of its Viaduct power station, which takes care of the downtown and west side sections of the city. A contract has been placed with the Westinghouse Company for a 1500-kw d. c. railway generator to be connected to a 32-in. x 68-in. x 60-in. Allis-Chalmers vertical engine. Boilers, condensers and auxiliary equipment have not yet been ordered. An extension is being built at the west end of the power station building, and it will provide for two units of this size, and it is probable that another similar unit will be ordered later this year. The company is continuing its policy of taking care of peak loads by means of battery stations, and has recently placed a contract with the Electric Storage Battery Company for a chloride battery with a capacity of 1825 amp.-hours to be installed in a station on Harvard Street, to take care of the Newburg district. The placing in service of more cars with a heavier equipment, and the adoption of power brakes, have made these additions necessary.

FENDERS AND POLITICS IN SHEBOYGAN, WIS.

Last summer the City Council of Sheboygan, Wisconsin, ordered the Sheboygan Light, Power & Railway Company to equip all its cars with fenders. The Council had a committee investigate fenders, which approved the fender used by the Milwaukee Electric Railway & Light Company. This fender was installed on the company's cars and was approved and accepted by the Board of Public Works of Sheboygan. After these fenders had been on the cars a few months, the mayor and a few of the councilmen asked the company to put on another style of fender. The company then ordered the Eclipse fender for its interurban cars, which up to that time had not been equipped with fenders of any kind, and offered to equip its city cars with the same fender, provided the city would reimburse the company for the cost of the original fenders. The fender commitee of the City Council accepted this proposition, which was nothing more than fair, in view of the fact that the city authorities had seen fit to change their minds within a period of a year, and had made written acceptance of the Milwaukee fender. However, this spring there was a city election in Sheboygan, and the city authorities were evidently for political reasons afraid to approve the fender committee's report and reimburse the company for the old fenders. Furthermore, the mayor of Sheboygan is a Socialist of the extreme type, and there happened to be dissension among the Socialistic ranks in Sheboygan this year, so that the mayor was having a hard fight. Apparently feeling the need of creating a diversion and getting the favor of the most radical wing of his party, the mayor decided it would be good politics to attack the street railway company, and without any notice ordered the arrest of all crews on cars not equipped with fenders. This grandstand play was made at a Council meeting one evening, and the following morning Ernest Gonzenbach, general manager of the company, was notified by the city attorney that he had been directed to make the arrests. Although most of the city cars are equipped with fenders, Mr. Gonzenbach thought it would be a good plan not to take any chances and ordered all cars into the car houses, where they stayed until evening. By that time all the local evening papers, even including the mayor's own organ, had come out denouncing the mayor's action. The public had a good taste of what the city would be like without street car service, and it was evident by night that the mayor, instead of making a shrewd political move, had taken about the worst step possible. The company also announced that all special rates would be withdrawn, and threatened to withdraw school tickets, six for a quarter tickets, commutation books, working-men's tickets, and clergyman's tickets. As the mayor evidently wanted war, the company started to give him what he wanted. One arrest was made of a motorman on a city car which runs as a single ender, and is provided with a fender at one end only. The motorman was arrested and the company furnished the bail. The city attorney in the Municipal Court the next morning was compelled to withdraw the case as the ordinance specifically states that the car shall be provided with fenders at the head end.

Distance always lends enchantment to the view, and some out-of-town newspapers, particularly those in Milwaukee, lionized the mayor on account of his stand, all assuming that all the cars were actually being run without fenders of any kind in defiance of the city ordinance. That the citizens fully appreciated the situation is shown by the defeat of the mayor for re-election at the municipal election on April 4.

THE INTERURBAN RAILWAY COMPANY'S PLANS

H. H. Polk, president of the Interurban Railway Company, of Des Moines, has announced that the company has finally decided to construct the line to Perry as well as the line to Woodward, this year. In a former statement printed in the STREET RAILWAY JOURNAL he had said that the Perry line would not be constructed during the present year. Mr. Polk states that the exact route of the Woodward line has not been decided upon. A decision will be made in a few days, however, as the company is anxious to complete grading specifications, and submit them for bids sometime during April. The line to Perry will branch off from the Woodward line several miles South of Woodward, and will run in a northwesterly direction to Perry. Work will commence this week on the construction of a connecting line within the city limits of Des Moines, between the Highland Park line and the Old Flint Valley line of the Des Moines City Railway Company. Deems & Barnes have the contract for this work. The Old Flint Valley line is to be reballasted and the track relaid with heavier steel. The Highland Park line is to be double-tracked from the point where this connection is made to Second Street and Grand Avenue in the heart of the city. This will give the Interurban a line of its own into the business portion of the city. Mr. Polk states that the line to Woodward and the branch to Perry are to be constructed for high speed purposes, and the route on the Highland Park and Flint Valley lines will aid them in this respect, as practically all of the right of way belongs to the City Railway system, and is not constructed in the streets.

NEW FOUNDRY FOR THE NILES-BEMENT-POND COMPANY

The Niles-Bement-Pond Company has announced the purchase of a large factory property at Nicetown, Philadelphia, formerly occupied by the Cresswell & Waters Company, for an addition to its Philadelphia plants. This property will be greatly improved and equipped with modern facilities for use as a foundry for the Niles-Bement Works branch of the company at Twenty-First and Callowhill Streets, and also the Niles Crane Works branch, at Meadow and Mifflin Streets. This increase of facilities is one of the many important developments that have been made by the Niles-Bement-Pond Company recently, owing to the recent large increase of business and many large contracts which have been taken. The combined plants in Philadelphia, regardless of the three other large plants operated by the company at Hamilton, Ohio; Plainfield, N. J.; and Hartford, Conn., will now employ about 2000 men, making it one of the largest industrial plants of the country.

THE TRACTION MUTUAL INSURANCE COMPANY

This company, which was organized some time ago by a number of prominent officials in Ohio and neighboring States, is progressing rapidly in completing the amount of insurance which is to be underwritten before the amount set for commencing business, viz., $20,000,000, is reached. The company has decided not to insure any car or repair shop that is not equipped with automatic sprinklers having two independent sources of water supply. This decision has necessarily caused some delay in securing the minimum limit of insurance set by the organizers before commencing business, but the advantages of covering exclusively such a desirable form of risk is self evident. Some thirty companies have already requested the Traction Mutual Insurance Company to prepare plans and specifications for an aggregate of something like 150 car houses, repair shops, power stations and sub-stations, and three engineers are constantly at work preparing plans for companies contemplating membership in the company.

The rules of the company provide that the company shall be administered by 15 directors; that the members shall be liable for assessment for a sum not exceeding five times the actual cash premium as written in the policy, and that the business shall be restricted to the insuring of electric light and power stations and their equipment against loss by fire and lightning.

The officers of the company and of the Electric Mutual Insurance Company, which is affiliated with it, are composed of: Horace E. Andrews, president of the Cleveland Electric Railway Company; Warren S. Bicknel, president of the Lake Shore Electric Railway Company; Henry A. Everett, president of the Northern Ohio Traction & Light Company and chairman of the board of directors of the Detroit United Railway; A. E. Akins, president of the Western Ohio Railway Company and vice-president of the Cleveland & Southwestern Traction Company, and Henry N. Staats, Ohio manager of the Associated Factory Mutual Insurance Companies of New England, and an insurance underwriter of some thirty years' experience.

THE CONSOLIDATED RAILWAYS PLANS

Plans are rapidly making for the unification of the lines of the Consolidated Railway Company, operating the electric railway properties in New England owned by the New York, New Haven & Hartford Railroad. In the interest of these plans and of measures before the Connecticut Legislature, which are essential to the perfection of changes now in contemplation, President Mellen, of the company, appeared before the committee on railroads of the Legislature in Hartford last Thursday. After discussing at length each of the measures, he invited those in attendance to interrogate him as to any points in doubt.

The applications for rights that are before the legislature range from plans that are of comparatively little significance to those that foreshadow expenditures of considerable sums, and changes in operation that are in a way revolutionary in their character. Among these are plans for power development, and the operation in harmony of electric lines and steam roads wherever such operation is possible. Mr. Mellen summarized those measures to which objection might be made by the public as follows:

"The right to acquire by condemnation the real estate necessary to correct the alignment and grades of our lines.

"The right to acquire available water power and develop the same for furnishing the electrical power needed to operate our lines.

"The right to acquire a right of way on which to erect lines of poles and wires for the transmission of such electrical power to the convenient points of use.

"The right to acquire steam railroad lines, many portions of which can be used to better advantage by our company than by their present steam railroad owners.

"The extension for two years from the rising of the present legislature of the rights heretofore granted the separate companies now owned by the Consolidated, to build certain branches specified in their charters and amendments thereto.

"The right to construct certain branches and extensions specified in the petition.

"The right to eliminate the interest of dissenting stockholders upon terms and conditions most liberal and protecting the company from the blackmail in the conduct of its business."

While not commiting himself formally, President Mellen, in talking about the application for power rights intimated that extensive plans are in contemplation for the development of water power. He said that as the successful and economical operation of an electric system depends greatly upon the generation of the electricity, the company is asking power to acquire and develop water powers not by condemnation, but by purchase, and no further right is desired regarding such water powers than has been freely granted by the State in connection with such powers when used for other purposes. As those powers are in many instances remote from the places where the electric current is used, the company is also seeking to acquire right of way for a pole line, by which the power generated may be transmitted to such place or places as the same may be required for use.

Mr. Mellen said very plainly that the period of acquisition of electric railway properties having passed, the tying together of these lines and their general unification were the next things to be considered. Here, again, some of his statements were only indicative of changes. In several cases, however, statements were made that settle questions about which there has been doubt for some time. For instance, there can no longer be doubt as to what the company proposes to do in regard to the long-talked-of line between Baltic, Conn., and Worcester, Mass. Mr. Mellen says that the line diverges from the present Old Worcester & Connecticut Eastern in the town of Central Village Falls on the east side, to a connection with the present tracks of the Norwich & Worcester, which the Consolidated Railway Company is going to take down to a point very near Jewett City, thence through Jewett City, and crossing the river, and connecting with the Norwich Street Railway at a point called Okum, so that the company will have two parallel street railway lines, and all the steam trains will run on the west side to a point just north of Jewett City, thence both will go through the city, and thence diverging again to the New England road, and the abandoned line of the Norwich & Worcester will be used for a trolley, resulting in the elimination of twelve grade crossings, and accomplishing for a minimum expense, what has been wanted for a great many years, an electric railway, as well as a steam line, through Jewett City.

Another statement of import made by Mr. Mellen concerned the Middletown Street Railway. He said it is the expectation to extend the Middletown Street Railway to a point about Westfield on the Meriden, Middletown & Waterbury, and use that line to a connection with the Meriden Electric, and thus make a through route by electricity from Middletown to Meriden. Officials of the company are working on the plans for this change, and if the report is what Mr. Mellen thinks it will be, the line will be built.

NEW PUBLICATIONS

The Industrial and Artistic Technology of Paint and Varnish, by Alvah Horton Sabin, M. S. John Wiley & Sons; 364 pages, with index. Price, $3.00.

This is a broad handling of the subject of paints and varnishes, with a brief account of their modern uses. The book will commend itself to those having to do with electric railway matters, chiefly because of its chapters on the protection of metals against corrosion. The work might well have been extended to take in the subject of car painting, inasmuch as practically all of the other uses of paints and varnishes are discussed.

Report of the Twenty-Second Annual Meeting of the Street Railroad Association of the State of New York. 295 pages. Published from the office of the secretary, W. W. Cole, vice-president, Elmira Water, Light & Railroad Company, Elmira, N. Y.

This is the complete report of the convention held in Utica on Sept. 13 and 14, 1904. The contents include all the papers presented, with the ensuing discussions, the full report of the committee on rules as now adopted, the questions and answers confined in the Question Box, the speeches at the banquet, etc. Among the illustrations are portraits of the officers, the group photograph of attendants taken in front of the meeting hall, and views in connection with the General Electric single-phase equipment on the Ballston division of the Schenectady Railway Company, and the temporary exhibition line erected on the Utica & Mohawk Valley Railway.

Imperial Directory and Statistics of Electric Lighting, Power and Traction works. Edited and compiled by C. S. Vesey Brown, London. Hazell, Watson & Viney, 1031 pages. Price, 12 shillings 6 pence.

This book gives financial statistics of the electric lighting, power and railway installations in Great Britain and Ireland and in the British colonies. The traction statistics published include the officers, mileage, number of cars, etc., also, in most cases, income account for the year and transportation statistics for from two to five years back, with the balance sheet for the private companies. In the case of very large companies, important extracts are given from the last annual report. The financial statistics for light and power plants are very similar to those published for the electric railway plants. The volume includes statistics as to tube railways and steam light railways.

A Text-Book on Roofs and Bridges.—Part I. Stresses in Simple Trusses, by Mansfield Merriman and Henry S. Jacoby. John Wiley & Sons; 312 pages. Price in cloth, $2.50.

This is essentially a bridge engineers' text-book. The authors, Merriman, professor of civil engineering in Lehigh University, and Jacoby, professor of bridge engineering in Cornell University, have long ago qualified as expert authorities in bridge matters, and they present in this work a mass of data, theories and opinions, concisely condensed and logically arranged. The work first appeared in 1888 as the first edition of Part I. Since that date six editions have been published. Properly to record the changes that have taken place in the science and art of the construction of simple bridges, and to give the student the latest point of view, is the object of the present volume. Although primarily a treatise on highway and steam railroad structures, the work will offer valuable aid to those charged with the design and erection of electric railway bridges. The text is elucidated and enriched by many sketches, full page illustrations of typical structures, and two inset drawings.

Manual of Corporate Organization, by Thomas Conyngton, 352 pages; buckram binding, $2.50; sheep, $3.00. Manual of Corporate Management, by the same author, second edition, 352 pages; same price. Published by the Ronald Press Company, 203 Broadway, N. Y.

As their titles imply, the first volume treats of the problems that arise when incorporation is contemplated or is under way, while the second, Corporate Management, treats of the proper conduct of the corporation after it is organized. Each book is complete in itself and may be used without reference to the other. While this is true the two together cover both the organization and the management of a corporation and make a very complete and practical set. The work has been prepared for use in any part of the United States and without special reference to the laws of any particular section, though the principles should be applied, of course, in connection with the local statutes. The use of the corporate form is now so common that a treatise of this kind should be a most useful adjunct in the office of every business man, not for the purpose of dispensing with the services of the legal profession, but to assist the reader in conforming to the technical requirements of the law and in understanding its purposes.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED MARCH 21, 1905

785,247. Noise Deadening Means; Charles D. Wood, Boston, Mass. App. filed Jan. 2, 1904. Between the cross-ties and rails and between the cross-ties and girders is inserted vulcanized rubber or other suitable material to prevent vibration.

785,284. Track Sanding Device; John H. Watters, Augusta, Ga. App. filed Oct. 10, 1904. A jet of air is directed against the body of sand in a direction opposite that in which the sand must flow, and another jet of air discharges into the outlet pipe to create a partial vacuum therein.

785,290. Brake Shoe; Paul Carpenter, Chicago, Ill. App. filed May 3, 1904. Comprises a back and a body attached to each other by an inclined tongue and groove connection and a wedge for fixing and retaining the parts together.

785,293. Electric Tramway; Alfredo Diatto, Turin, Italy. App. filed Sept. 30, 1902. Mechanism whereby a trailer carried by the car will send a weak current through contact devices thereby energizing electro-magnetic circuit closers for closing the main circuit.

785,303. Brake Shoe; Joseph D. Gallagher, Glenridge, N. J. App. filed May 3, 1904. Comprises a cast body portion and a detachable steel back having thereon integral attaching means for the brake head.

785,315. Electric Railway; Timothy Mahoney, San Francisco, Cal. App. filed Dec. 1, 1903. As the car moves from one section to another, solenoids beneath the several sections are successively and temporarily excited to lift the switches and cut in the current to the trolley rail and car, the solenoids becoming inert as soon as the rear brushes leave their respective sections.

785,372. Trolley Head; Eugene J. Parker and Louis N. Colwell, Providence, R. I. App. filed April 27, 1904. Provides facilities for readily inserting a new wheel, means for permitting a variation of the plane of the wheel during the passage of curves, and improved means of uniting the end of the harp and trolley pole.

785,421. Car Seat; Henry S. Hale, Philadelphia. Pa. App. filed April 29, 1904. A frame including at each end parallel plates having guideways arranged on arcs having different centers, a walk-over back, and back-supporting arms operating between said parallel plates and influenced in their inclination by said guideways.

785,482. Fender; Raffaela D'Oronzio, New York, N. Y. App. filed Dec. 7, 1904. Comprises a plurality of hinged sections, a latch for retaining the sections in a raised position, and means operable by the contact of an object with the fender-sections for moving the latch.

785,570. Car Brake; Henry Poth, Elliott, Pa. App. filed Nov. 28, 1904. A brake shoe adapted to contact with the ground or surface of the roadbed between the tracks.

785,598. Trolley; Clemens Dillhoff and Joseph Hastreiter, Morgantown, W. Va. App. filed Dec. 13, 1904. Details.

12,327. Car Brake Appliance; Daniel Taggart, Indianapolis, Ind. App. filed Jan. 23, 1905. A novel form of drum by which the operator may quickly take up the slack of the chain.

UNITED STATES PATENTS ISSUED MARCH 28, 1905

785,758. Electric Railway System and Conduit; George W. Olinger, Orchard, Ohio. App. filed June 19, 1903. A conduit comprising main girder members, L-shaped in cross section and secured to the side of the main members to form the bottom and outer side of the conduit, and a combined guard and tie plate, channel-shaped in horizontal section, and connecting the ends of the secondary members to form a lateral space for the insertion and removal of the trolley arm and wheel.

785,759. Metal-Tired Car Wheel; Adam J. O'Neil and Frank L. Wrenn, Scranton, Pa. App. filed Sept. 24, 1904. A car wheel having a metal center with a metal tire, means for fastening the tire to the center consisting of a dovetail projection on one side of the center, and a shrunk ring having a dovetail face fitting closely to the other side.

785,780. Railway Switch; Frederick Uhtbrock, New York, N. Y. App. filed May 20, 1904. Cog wheels mounted in the roadbed and suitably connected with the twitch-point are adapted to be engaged and rotated by suitable means mounted on the car, to thereby throw the switch in advance of a moving car.

785,781. Car Construction; William B. Waggoner, Chicago, Ill. App. filed Oct. 12, 1904. A hollow car sill made of metal, castings secured in the ends of the sill, and a truss-rod running from end to end of the sill, the ends of the truss-rod being secured in the castings.

785,840. Car Fender; Charles H. Turner, New York, N. Y. App. filed June 25, 1904. The fender is mounted upon a track secured to the under side of the car, so that it will slide underneath the car upon striking an unyielding obstruction, to avoid breaking the fender.

785,909. Electric Railway System; John C. McDonald, New York, N. Y. App. filed Feb. 9, 1904. Details of a switch for permitting the current to flow into a short length of the third rail.

786,036. Trolley Wheel and Holder; Henry N. King, Adrian, Mich. App. filed June 20, 1904. A hard metal insert ring in the tread of the trolley wheel.

786,188. Trolley; James L. Brownlee, Pittsburg, Pa. App. filed June 10, 1904. Details.

786,193. Railway Crossing Structure; Warner B. Cooke, Jenkintown, Pa. App. filed Dec. 21, 1904. Details of a hard metal insert plate for crossings, etc.

786,219. Trolley; Sando Kasco, Allegheny, Pa. App. filed Dec. 9, 1904. Details.

PERSONAL MENTION

MR. B. H. WARREN, president of the Allis-Chalmers Company, sailed for Europe last week on a business trip.

MR. A. L. ROGERS, formerly with the Sterling Company, has become connected with the Plat Iron Works Company, of Dayton, Ohio, in New York.

MR. JOHN D. TWIGGS, city engineer of Augusta, Ga., has been made chief engineer of the Raleigh & Durham Passenger & Power Company, which plans to build an electric railway from Raleigh to Durham, N. C.

MR. E. H. KEATING, formerly general manager of the Toronto Railway Company, of Toronto, Ont., has been appointed manager and engineer for Mackenzie & Mann of their street railway interests in and around Monterey, Mexico.

MR. W. J. CLARK, manager of the General Electric Company's foreign department, has been elected president of the Perforated Music Roll Company. Mr. Clark's connection with the Music Roll Company will not, of course, in any way alter his present relations with the General Electric Company.

MR. M. M. REID, master mechanic of the Appleyard lines, has been appointed acting superintendent for the Dayton, Springfield & Urbana and the Urbana, Bellefontaine & Northern Railways. Mr. Theodore Stebbins, general manager of the system, is desirous of securing an experienced man to fill this position permanently.

MR. D. W. MURPHY, formerly electrical engineer of the New York & Queens County Railway Company, is now connected with the Manila Electric Railroad & Light Company, at Manila, P. I. Mr. Murphy has been associated with J. G. White & Company, of New York, for the past two years, for a large part of the time on their foreign work. His first service with the company was the installation for the White interests of a lighting plant for the Paxatany Electric Light Company, of Harrisburg, Pa. After the completion of that work he was sent to San Jose, Porto Rico, and from that place to Manila.

MR. WILLIAM F. POTTER, president of the Long Island Railroad, died at his apartment in the Hotel Marie Antoinette, New York, on Sunday, April 2. Mr. Potter had been ill since March 3, when he was prostrated by a severe cold. He was born in Ithaca, N. Y., in 1846, and received his early railroad training in the West. In 1892, he became general superintendent of the Long Island Railroad, and on Jan. 13, 1905, was appointed president of the company to succeed Mr. W. H. Baldwin, deceased, under whom plans for the electrification of the road were all worked out. Mr. Ralph Peters, superintendent of the Pittsburg, Cincinnati, Chicago & St. Louis Railroad, in charge of the southwestern system of the Pennsylvania Railroad lines west of Pittsburg, has been elected to succeed Mr. Potter in the Long Island Company.

MR. FRED W. BUTT has resigned as chief draughtsman of the mechanical department of the Brooklyn Rapid Transit Company, to become assistant engineer in the electrical department of the New York Central Railroad, in charge of design of its new suburban rolling stock for electrical operation. Mr. Butt has been connected with the Brooklyn Rapid Transit Company for more than eight years, in charge of the draughting work for both surface and elevated divisions. His experience has covered all branches of the service, extending from the time of the earliest experiments in electrical operation on the elevated lines to the recent development in the electric operation and its extension to all lines of the company. He has been intimately associated with the recent reconstruction work upon the elevated rolling stock equipment, and is responsible for many important improvements in detail which have been incorporated, and also in the design of the large amount of new equipment recently ordered by the company.

MR. J. B. N. CARDOZA, assistant engineer of the railway department of the Virginia Passenger & Power Company, will leave April 17 for Norfolk, to become superintendent Berkley Street Railway Company, a constituent of the Norfolk Railway & Light Company. Mr. Cardoza began his street railway work with the Richmond Traction Company in 1898, in the purchasing department. He was soon promoted to the position of assistant to Superintendent S. P. Cowardin. When the lines were consolidated Mr. Cowardin was made engineer of construction, and Mr. Cardoza was made his assistant. Later Calvin Whiteley, Jr., was made chief engineer of the railway department of the company, and Mr. Cardoza was promoted to assistant to the chief engineer.

MR. T. A. CLELAND has been appointed superintendent of equipment of the Consolidated Railway Company, of New Haven, Conn., in charge of all car equipments. This company operates the electric railway properties owned by the New York, New Haven & Hartford Railroad, which now aggregate more than 400 miles. Mr. Cleland's experience has been chiefly with the Westinghouse Company, with which he was connected for more than 17 years. He entered the employ of that company in 1888 as a machinist. Advancement came rapidly, and in 1890 he mounted the first two motors built by the Westinghouse Company on a 14-ft. closed car on the Pleasant Valley Railway in Allegheny, Pa. In the latter part of 1890 Mr. Cleland and Mr. Edward Gray equipped the first complete electric railway for the Westinghouse Company. This was in Lansing, Mich. In 1899 Mr. Cleland was selected to supervise the equipment of the French works of the Westinghouse Company at Havre. Here he remained as master mechanic for two years. His next important work for the company was in England, whither he went in 1901 to equip the company's Manchester works. Here he remained about two years, afterward returning to the company at Pittsburg. Mr. Cleland's headquarters are in New Haven.

MR. W. W. WHEATLY, who went to Mexico City a little over one year ago to become general manager of the Federal District Railways of that city, has recently been elected president of that company in place of the Hon. Chandos S. Stanhope, who has resigned. Mr. Wheatly has also been elected managing director of the Mexican Traction Company, an independent company, which was acquired about one year ago by Wernher, Beit & Company, of London. These companies, of which Mr. Wheatly is now the active head, own and control all of the street railway lines in the City of Mexico and its suburbs, and serve a population in the valley of Mexico estimated at nearly 1,000,000. The securities of all railways are owned practically by the one firm—Wernher, Beit & Company, of London, who have extensive interests in mining in South Africa, and also in Mexico. The same firm also owns the street railways of Capetown and Port Elizabeth, South Africa; Lisbon, Portugal, and city of Pueblo, in Mexico. It is reported that Mr. Wheatly's management of the Mexican tramway system has been very successful, and that the owners have decided to place in his hand the full responsibility for the administration of their properties, which, in addition to the tramways, include other extensive interests in and around the City of Mexico.

MR. WILLIAM OFFUTT MUNDY, of the Westinghouse Electric & Manufacturing Company, died at the East End Hospital, Pittsburg, Pa., on Wednesday, March 29, from blood poisoning. Mr. Mundy was a graduate of the Rose Polytechnic Institute, of Terre Haute, Ind., and was still a young man, not yet having reached thirty. Until a year ago he was master mechanic of the St. Louis Transit Company, of St. Louis, Mo., where his work attracted the attention of railway operators. The new shops of that company, embodying many of the best labor-saving devices, were built under his direction. His powers to originate were not confined, however, to the equipment of railway shops, for he did much toward the improvement of systems of electric train control. In fact, he made commercially successful the G. E. type-M system. He was also the inventor of an air brake appliance of much merit. Quite recently he invented a street car window, the construction of which permits the removal of window sashes to facilitate the repairing and cleaning of the windows. In April, 1904, Mr. Mundy resigned his position with the St. Louis Company to become a commercial engineer of the Westinghouse Electric & Manufacturing Company, of East Pittsburg, Pa. Mr. Mundy was a prominent member of the American Railway Mechanical and Electrical Association, and was third vice-president of that body last year. He is survived by a widow, formerly Miss Kathleen Eddy, of Detroit, Mich., to whom he was married on Jan. 4, 1905.

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REMITTANCES.—Remittances should be made by check, New York draft or money order in favor of Street Railway Journal.

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NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 8000 copies are printed. Total circulation for 1905, to date, 123,550 copies—an average of 8237 copies per week.

Announcement Concerning Back Numbers

The publishers of this journal have heretofore endeavored to keep on hand indefinitely a supply of the separate numbers of back volumes. Experience shows that there is very little demand for such numbers more than a year old, while the trouble involved in keeping them is wholly out of proportion to the value of the accommodation to subscribers. It has been decided, therefore, to keep separate copies for but twelve months back of the current issue. Orders for issues prior to May, 1904, should be sent in immediately, as the stock on hand will be disposed of at an early date. Bound back volumes will, however, be kept on hand as heretofore.

Proposed Reorganization of the American Street Railway Association

The tentative plan for the proposed reorganization of the American Street Railway Association is contained in the report of the committee on reorganization which is printed in this issue. It outlines a radical change in the form and methods of the association and its allied societies, and will naturally constitute a topic of great interest, not only to the presidents and general managers, who are the active working officers of the American Street Railway Association, but to the various heads of departments interested in the departmental organizations. The plan proposed differs somewhat from that suggested by Richard McCulloch, published in our issue for Feb. 11, but preserves the features of the formation of a parent organization and subsidiary bodies, which received general indorsement at the St. Louis convention, as well as at subsequent meetings of the executive committee. In the preparation of this plan, the working of all of the steam railroad associations was carefully considered by Prof. Norris, as was also the scheme of the American Society for the Advancement of Science and other similar bodies, to which frequent reference has been made. The features in all of these organizations, which have proved most successful and which were appropriate to the purpose of the reorganized Street Railway Association, have been sifted out and have been combined so as to form a working plan.

The complete report prepared by Prof. Norris is very voluminous, and we shall not attempt in this place to digest, even briefly, the abstract of the report which is published elsewhere in this issue. We must refer, however, to two or three features which strike us as particularly admirable. One of these is the idea of charters for future subsidiary associations, which will prevent an unnecessary increase in the number of these bodies, while it gives the utmost freedom for the organization of those for which there is any real need. The second is the preservation of practically autonomous government for those subsidiary associations which may be authorized, and the grant to them of the funds necessary to carry out their work in the most efficient manner. The third is the arrangement for membership, by which persons who are interested in the objects of the association or of any of the subsidiary associations can become associate members, thus enlarging the general interest in the association, while the dues of the active member companies are made proportional to their gross receipts. The latter provision is especially liberal toward the small companies, as the number of delegates which each company can send to a convention is not made dependent upon the amount of dues paid This feature should attract to the association a large number of the smaller companies which are not now members of the association.

The point upon which we imagine there will be the greatest amount of discussion is that relating to the time of holding the annual meeting, or meetings. The committee on reorganization has made no recommendation on this point, but has outlined what it considers the advantages and disadvantages of both general and independent conventions. The latter is the method followed by the steam railroad companies, with whom the managers meet at one time, the master mechanics and car builders at another, the track engineers at another, and so on. The principal argument in favor of this method is that it does not interfere so much with the routine duties of a road to have one officer away at a time as to have a large proportion of the force called off to attend a convention. There is also the incidental advantage that the different departments can select periods of the year which would be most convenient for them; thus the claim agents can meet in the summer when most of the courts are not in session; the track engineers can hold their convention in the winter when there is little or no construction work in progress, etc.

On the other hand, the advantages of having all of the associations meet at the same, or nearly the same, time are very great, and seem to us to outweigh any objections to this course. In the first place (and we consider it perhaps as important as any), independent meetings would interfere very seriously with any plan for exhibits. If the conventions, particularly those of the managers and of the mechanical departments, are to be held in different cities and at different times of the year, few manufacturing companies could afford to install much of an exhibit, and this important feature of the annual conventions would practically disappear. Again, in many cases, especially among the smaller companies, one or, at most, two men have charge of the operating and mechanical, and even of the accounting, departments, and would be the ones who would attend the meetings of the principal sections. With the conventions at one place and at about the same time, these members could participate in the sessions of several associations, while they could not absent themselves from home three or four times during the year. Even on the larger roads, many managers and heads of departments find it instructive and desirable to be brought into contact with gentlemen connected with some other department than their own at the annual conventions. But if the system of independent conventions were followed, no one would meet any railway representative other than those in his own particular department, unless he was away several times during the year.

Finally, we believe that what is really the only objection to the common convention time and city—that is, the absence of too many officers at the same time—will not usually prove a very serious objection. If the convention is held at any central point in the country it will be only a night's journey, or slightly more, for the majority of the members, and if the sessions extended over several days we see no reason why certain officers could not attend during the days at which the subjects in which they are particularly interested are to be discussed, and then return to give others a chance. Altogether, it seems from the evidence in hand at present that the arguments in favor of the general convention, even if the meetings have to be extended over a week or ten days, outweigh those of widely separated conventions.

The executive committee expects to hold its next meeting early in June, and by that time hopes to receive a general expression of opinion upon the proposed plan from those members who are interested in it. The work already accomplished by the committee is admirable, and will, we are confident, receive the hearty commendation of those street railway companies which have the interests of the association at heart. The committee has taken up the complex situation confided to its care in a most exhaustive manner, and with the changes, if any, which may be made at the June meeting and subsequently during the summer, we are confident that the Philadelphia convention will see a working plan ready for adoption by the several associations.

The Ventilation Problem Again

We are publishing an interesting communication on this topic from Mr. Taylor, and in view of several recent publications bearing on the same subject, a discussion would seem to be in order. Mr. Taylor's paper is of value in bringing plainly to the front the technical points involved in the matter, as well as outlining a method of approximating the amount of carbonic acid in the air. The fact should be remembered, however, that, as Mr. Taylor points out, the percentage of carbonic acid present is only a very rough indication of the amount of contamination. From a hygienic standpoint, air in overcrowded places is always much worse than this percentage would indicate. The really dangerous elements in contaminated air are the organic excreta, which have definite toxic properties quite apart from the implied danger of special infection. The normal carbonic acid in the air is only about 4 parts in 10,000, and an excess comes mainly from exhaled air loaded with organic matter. A slight increase comes in cities from the large amount of fuel burned in a relatively small space, but so far as cars are concerned this is not likely to amount to more than 1 part or 2 parts in 10,000, the rest having a source much less reassuring to the fastidious.

The method of testing suggested by Mr. Taylor is likely to lead, in our judgment, to an underestimate except in very skilful hands. Another, and quite as simple a method, consists in shaking up the sample of air obtained, as Mr. Taylor suggests, but much greater in quantity, with barium hydrate, and then neutralizing the unaltered portion of the hydrate with a standard oxalic acid solution. The details of the test can be found in any handbook of gas analysis, and the results obtained in a few minutes with the simplest sort of apparatus are highly accurate. But as regards street cars in actual service it is unfortunately true that the air does not in many, perhaps most, cases reach even the low standard of 20 parts carbonic acid in 10,000 assumed by Mr. Taylor. A series of tests recently laid before Surgeon-General Wyman showed only five out of nineteen analyses below 20 parts per 10,000, while some of the worst examples, oddly enough, were from cars in the early morning, showing the need of active ventilative measures at the car houses. The long and short of the matter is that there is no disguising the fact that a small enclosed space like a street car, normally crowded when in active service, must of necessity show seriously vitiated air unless actively ventilated. The doors do not in practice afford any considerable relief, for they are often blocked, and unless in a high wind do not let in much air, particularly when unassisted by ample ventilators in the roof. The analyses just referred to show in one instance nearly 20 parts per 10,000 of carbonic acid in a car only partially filled and running with the rear door wide open. Bad air will not leave unless it is kicked out by fresh air. The trouble is that no means has yet been devised of adequately ventilating a small, low studded space like a street car without creating drafts, and, what is more, we do not see any hope of accomplishing the feat, however desirable it may be.

In fact, one may as well frankly face the situation at its worst and realize that ventilation is a most difficult problem, rendered all the more difficult by those passengers who insist on having the cars hot and loudly protest if the ventilators are opened. The most sensible word we have heard on the subject is the reported statement from Gen. Bancroft, of the Boston Elevated, who is quoted as saying that his company had done its duty in providing adequate ventilators and instructing its men to follow the wishes of the passengers as to opening or closing them. Until the passengers come to some conclusion as to whether they prefer fresh air or foul and hot air nothing much more can be done. One cannot ventilate properly a closed space 8 ft. x 8 ft. x 30 ft., crowded with passengers, without a perceptible influx of the exterior air. The public takes a street car in cold weather while clothed for sufficient protection against a Northern winter, and if it would only realize the danger of an overheated car when one is thus clothed there would be fewer colds caught and ventilation would be easy. But so long as a chorus of protest arises whenever some sensible person opens a ventilator the average condition of the air will be bad. We believe that every street railway company in the country wants to see its cars properly ventilated and is perfectly willing to provide adequate apertures for the purpose, but it must have the sympathy of the public in carrying out its good intentions. We are glad to see the subject agitated, and wish only that the campaign of education could be directed toward the hot-air fiends who kick at the very smell of fresh winter air. We all know them—the shriveled old gentlemen who come into the car, look about for the heaters, cuddle up over them, throw open their fur-lined overcoats and then raise shrill protests if they catch sight of an open ventilator. Doubtless improvements may be made in car ventilation, and we shall welcome them, but in the long run fresh air depends on the willingness of the passengers to have it let in. Boards of Health have perhaps the power to direct that ventilators shall be kept open, and if they do so we advise the posting of a placard in each car stating that such orders have been given and will be vigorously obeyed. Then it is formally up to the passengers, and if they do not like it they can have it out with the Board of Health. No street railway man will ever pose as the champion of foul air. That function is reserved for the fussy passenger who scolds the conductor for letting in the outside atmosphere.

Chicago and Municipal Ownership

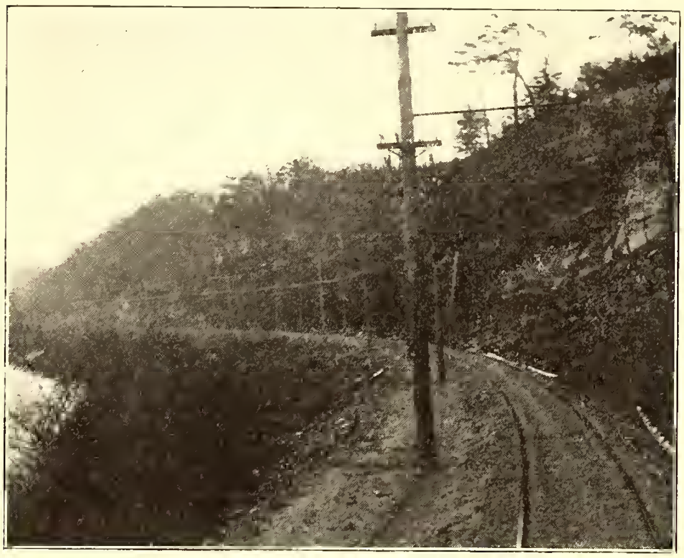
The result of the last city election in Chicago seems to show unmistakably that the majority of the people of Chicago have set their hearts on municipal ownership of the street railways in that city. The vote taken on municipal ownership of the street railways as a question of public policy at the Chicago election of a year ago was so overwhelmingly in favor of municipal ownership that the turn which the mayoralty campaign took this spring is not altogether a surprise. We can simply say now what we said a year ago, that not one voter in ten in Chicago understands the present status of the traction question in his city. The majority simply knew that the present service was bad, and that controversies and discussions over franchises had been going on for the past eight years without tangible results. Without going into any of the legal questions and difficulties, the same majority of voters simply reasoned that municipal ownership would put an end to all this, and voted that way. A year ago we were inclined to take it that the overwhelming vote in favor of municipal ownership as a question of public policy was the result of a desire to have the possibility of municipal ownership as a kind of a club to hold over the heads of the traction companies while dickering about franchises. The result of the election this spring, however, shows unquestionably that the majority of the people of Chicago really believe in the municipal ownership idea. Both the Republican and Democratic candidates for Mayor advocated ultimate municipal ownership, which bears testimony to the fact that whatever might be the private convictions of the party leaders as to the feasibility of municipal ownership, they realized that public sentiment in its favor was strong enough to defeat any candidate for Mayor who would not advocate it.
to defeat any candidate for Mayor who would not advocate it.

The situation in Chicago just now is therefore most interesting. In fact, the most interesting it has been at any time in the past eight years. The outcome will be either a sale of the street railway lines and existing franchises to the city or a series of long continued bitter legal battles. Prominent traction financiers, soon after the election, announced that the companies would be entirely willing to sell to the city at a reasonable price. The rub will, of course, come when the city and companies get together to name a "reasonable price." Failure to agree on that will mean either a peaceful arbitration of differences or a long struggle in the courts. The question of purchase of street railway lines by the city was provided for by legislation passed by the Illinois State Legislature two years ago and known as the Mueller law. This law provides that the city can purchase street railways, giving in payment certificates which shall be a first lien upon the receipts of the street railway lines, and that in case default is made of the interest on these certificates, the holders thereof may step in and operate the lines themselves for twenty years. The legality of the issuance of such certificates has not been tested in the courts. We imagine also that this kind of "certificate" would be looked at askance in Wall Street, when backed up by a management appointed for political reasons, as that in Chicago would be apt to be. There is no precedent for the sale of this kind of security, which would, of course, be on an entirely different basis than that of a municipal bond, which has the entire credit of the city back of it. In the meantime franchises on Adams Street and a few other streets belonging to the Chicago Passenger Railway Company having expired, according to the city, the latter is advertising for the construction of municipal street railway lines thereon. This will test the legality of the Mueller law certificates and, in a sense, the ability of the city to operate a railway line.

It is indeed unfortunate that conditions have existed in Chicago for several years past which have made it impossible for the companies and the representatives of the city to get together and agree on terms which would enable the companies to go ahead and give the city the first-class service it should have. The trouble has not been with the companies, which were willing and eager to negotiate reasonable terms for franchise extensions, nor with the local transportation committee of the Chicago City Council, which is composed of honest and capable business men able to take a fair view of the situation. Proposition after proposition has been advanced for the settlement of the question on a franchise basis, but by the time one plan had got through the ponderous machinery of the city government, and to a point where action could be taken, another city election would come along and postponement would be made pending the reorganization of the Council, and so on ad nauseam. We expect to have a good deal more to say about the situation as it develops in Chicago, but the interminable delay and inaction over the preliminaries presages anything but a business policy if the Council should ever assume the operation of the transportation properties.

THE COLUMBUS, NEWARK & ZANESVILLE ELECTRIC RAILWAY

The Columbus, Newark & Zanesville Electric Railway, which was completed a few months ago, is an easterly extension of the Columbus, Buckeye Lake & Newark Traction Company's line from Columbus to Newark, one of the best known and most



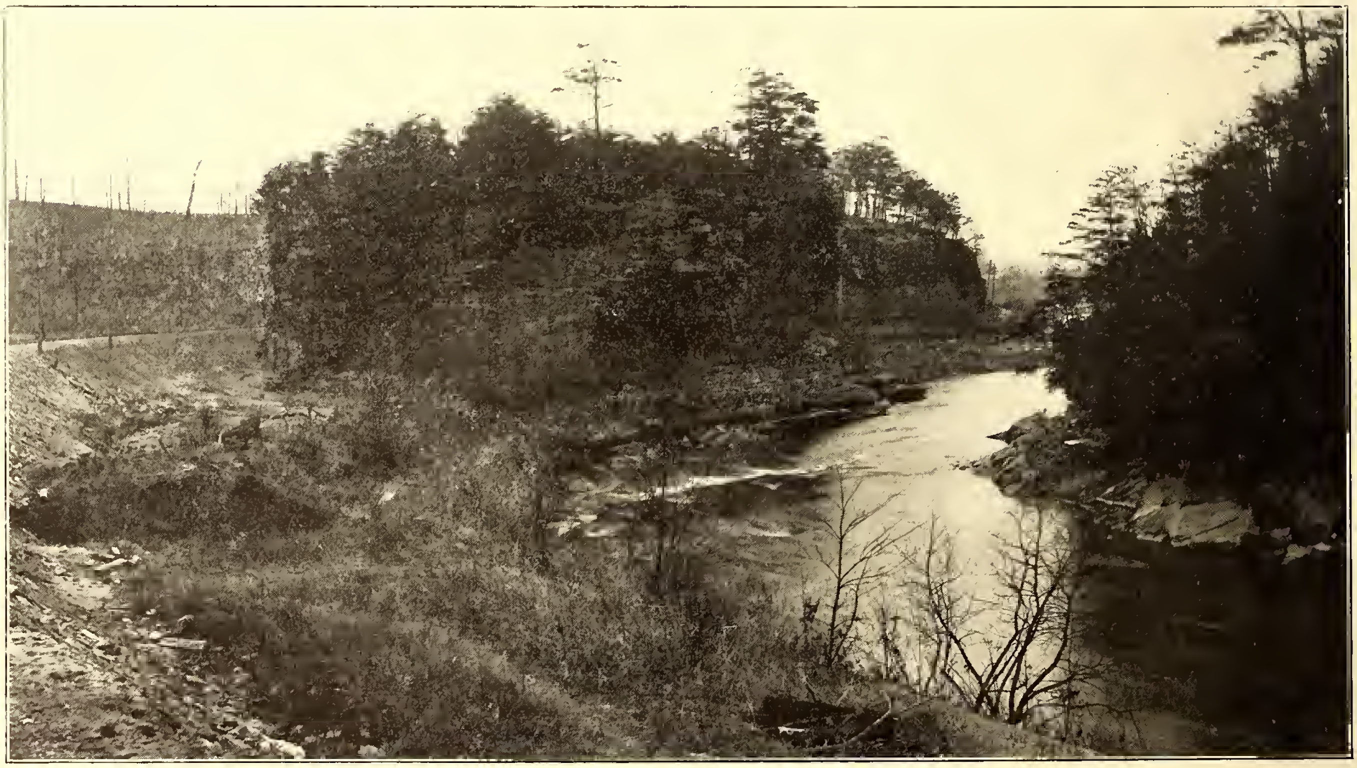
RAILWAY PARALLELING A BEND OF THE RIVER

prosperous properties in Ohio. While separate from a financial standpoint, the two lines are operated under one management, and cars run through from Columbus to Zanesville, 65 miles. The Newark & Granville Railway and the Newark city lines were merged with the Columbus, Newark & Zanesville Electric Railway about the time the extension was ready for operation. The entire lines under the management of J. R. Harrigan, of Newark, embrace about 85 miles, and form important links in the chain of lines which Tucker, Anthony & Company, of Boston, are building in Ohio. The Columbus, Buckeye Lake & Newark property was thoroughly described in the STREET RAILWAY JOURNAL of Aug. 1, 1903, while the Canton-Akron Railway, Canton-New Philadelphia Railway and Tucarawas Traction Company's lines, also part of this chain, were described in the issue of May 28, 1904.

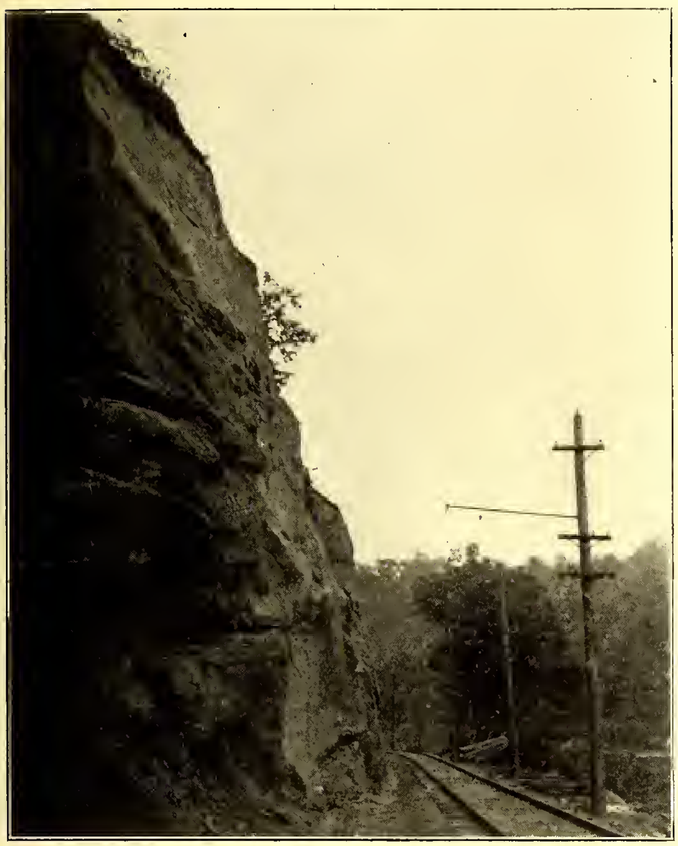
THE TUNNEL AT BLACK HAND ROCK

TERRITORY

The building of this 27-mile extension presented engineering difficulties such as have seldom been encountered in the comparatively level country which is the rule in the Central West. The district was exceedingly rough, cut up by rocky hills, almost approaching mountains in extent. The engineers found it desirable, therefore, to follow the example of the Baltimore & Ohio Railroad, which the road parallels, and follow the valley of the Licking River. The steam road follows one bank, while the electric road parallels the other. The track was built on a natural ledge, and at all points it is above high water mark. Some filling was necessary at certain low points and a great deal of expensive rock cutting was done. The river occupies a deep canyon, and at many points the solid rock walls rise precipitately 300 ft. to 400 ft., giving the traveler the impression that he is in Colorado instead of in the generally



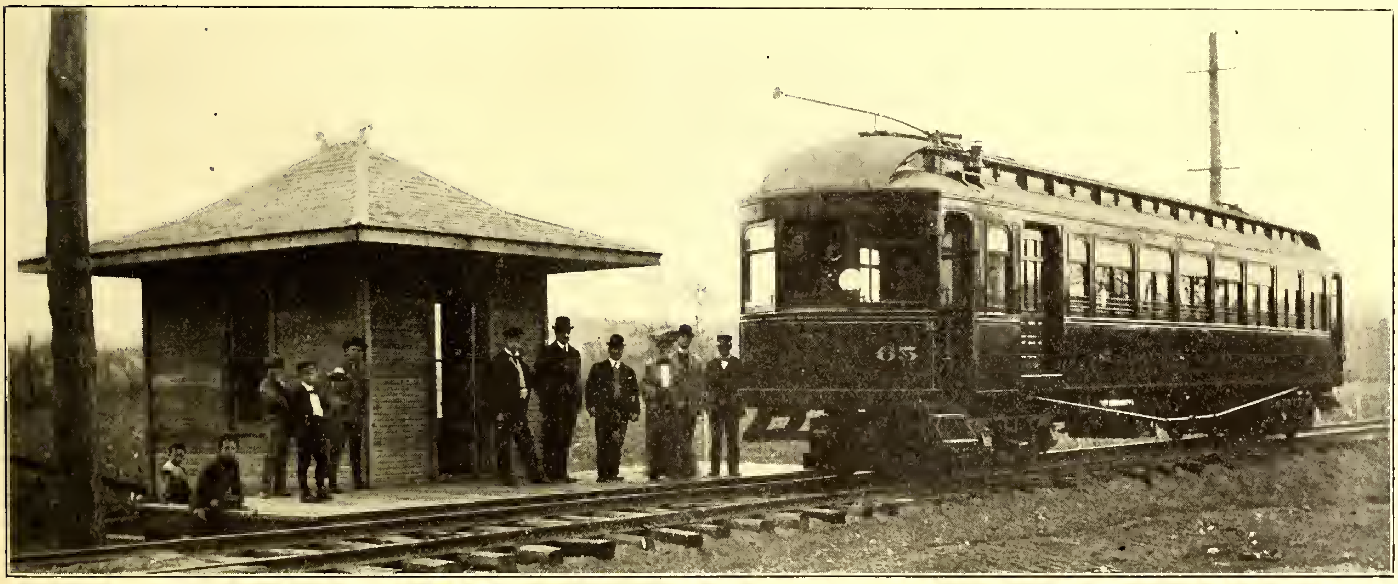
THE PASSAGE AT BLACK HAND ROCK—A CHARACTERISTIC EXAMPLE OF THE SPLENDID SCENERY ALONG THE LINE OF THE COLUMBUS, NEWARK & ZANESVILLE ELECTRIC RAILWAY level Ohio. The river makes frequent turns and the road has numerous curves, all of which, however, were laid out to permit high speeds. The scenery is beautiful, its equal being hardly offered by any other traction line in that part of the country. At one place an enormous jutting rock made it necessary to tunnel nearly 400 ft. through solid stone. Views of the tunnel and some of the river scenes are presented herewith.



AN EXAMPLE OF THE LARGE ROCK CUTTING REQUIRED ON A 6-DEG. CURVE ONE-HALF MILE LONG

A PICTURESQUE SCENE ALONG THE BANKS OF THE LICKING RIVER. STEAM ROAD ON OPPOSITE SIDE

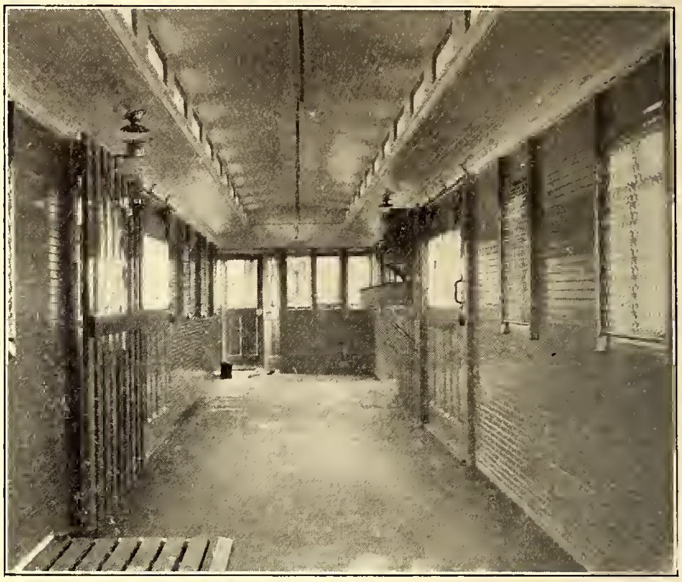
The plan of following the river made it impossible, of course, to strike the centers of towns, and the line is wholly on private right of way except in the terminal cities. The towns are back on the bluffs, and one seldom sees a house, although the line has considerable intermediate population. Station buildings are provided at towns and principal stopping points; one of these is illustrated. The wild country makes this a good district for hunting and fishing. So many hunters are carried that the company adopted the rule of requiring every hunter to take his gun to pieces before entering the car, thus relieving the passengers of the liability of being shot. There are several small parks and picnic grounds along the route, and with the better transportation facilities the district will undoubtedly become more popular for pleasure seekers. Black Hand Rock, where the tunnel mentioned is located, is rich in Indian legend, and it is said that the face of the rock formerly showed a huge black hand.



CAR STOPPING AT A WAITING ROOM ON THE LINE OF THE COLUMBUS, NEWARK & ZANESVILLE ELECTRIC RAILWAY

Zanesville, which has a population of about 25,000, is the seat of Muskingum County. The intermediate population between Newark and Zanesville is about 3000. Zanesville is an important railroad center and coal shipping point, with several large iron working factories. The interurban cars enter the city over the tracks of the Zanesville Railway, Light & Power Company, crossing the new concrete Y bridge, one of the attractions of Zanesville. This bridge provides facilities for turning the cars. The latter run to the business section on the main street, where there is a ticket office and waiting room.


SEATING ARRANGEMENT OF PARLOR CAR FOR LIMITED SERVICE


AN INTERIOR VIEW OF THE EXPRESS CAR USED BY THE COLUMBUS, NEWARK & ZANESVILLE ELECTRIC RAILWAY

The city company has a franchise for a loop in the business district, and as soon as possible this will be utilized by the interurban cars, when it is probable that the company will have its own station, with a siding for freight.

Zanesville promises to become an important interurban center, as no less than seven roads have been projected out of the town in various directions. It appears reasonably certain that within a year or more a road will be built north from Zanesville to Coshocton and New Philadelphia, which will complete the chain of lines between Cleveland, Columbus and Cincinnati, and as the Columbus, Newark & Zanesville is in the direct route to the State capital and hundreds of points in Ohio and Indiana, it will benefit greatly by the feeders being built to Zanesville and the resulting through traffic.

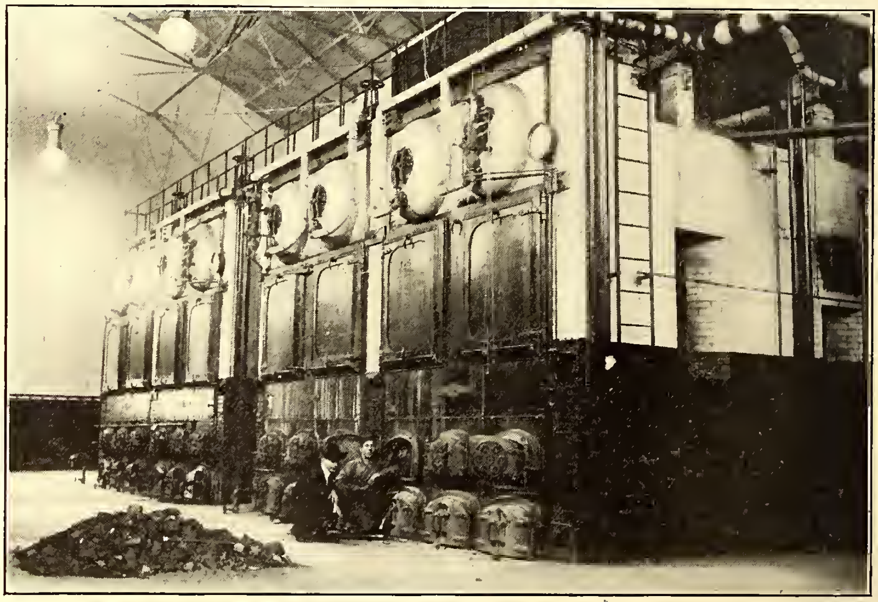
TRACK AND OVERHEAD CONSTRUCTION

The track and overhead construction is of the most approved type. Located high above the river, the track drainage is excellent, and as the roadbed follows almost a water level the maximum grade is 1½ per cent, this being on a bridge crossing Licking River and over the Baltimore & Ohio Railroad approaching Zanesville; the bridge has a 1400-ft. timber approach and a 200-ft. truss steel span. The tunnel mentioned is 364 ft., and required an unusual amount of blasting and drilling, as the rock is very hard; it is 14 ft. high and 10 ft. wide. There are several long curves, one of them a 6-deg. curve 2600 ft. long around the face of a mountain of rock. This is illustrated, the same view showing the details of the overhead work.

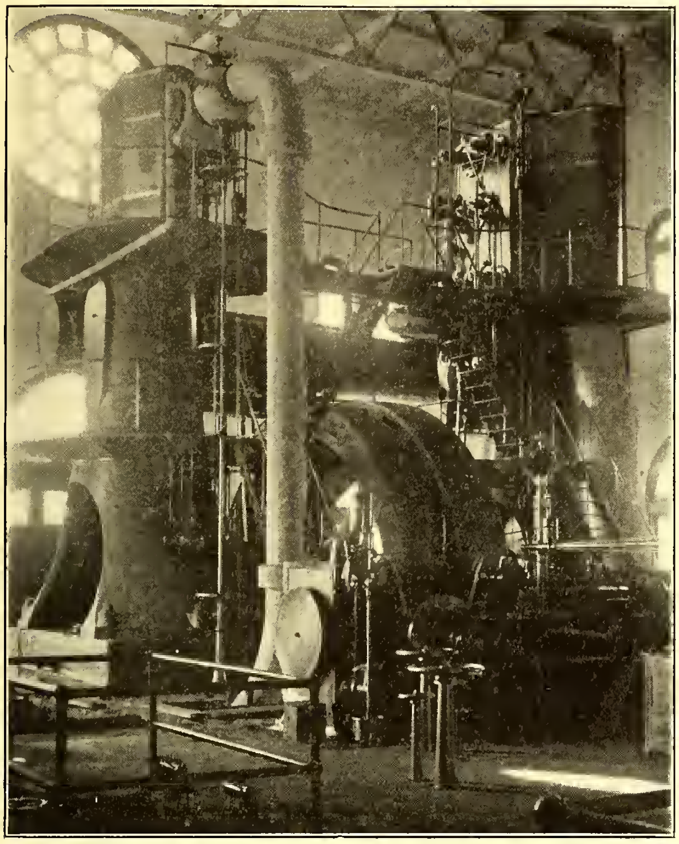
The poles are 35 ft. with 8-in. tops. There are three cross-arms, all of them braced with iron. The upper arm carries two of the high-tension lines mounted on Hemingray triple petticoat glass insulators. The pin for the third insulator is set into the top of the pole. It has a weephole and a porcelain plate to keep out water. The high-tension wires, No. 4 hard drawn copper, are in a 36-in. equalateral triangle and are transposed at intervals. Two 330,000-circ. mil aluminum feeders are carried on the second arm, with pins for another set installed. The third arm carries two block signal wires and two telephone wires. The brackets are Ohio Brass wrought-iron pipe, 2 ins. in diameter and 11 ft. long, of the flexible suspension type. General Electric type MD lightning arresters are placed on every twentieth pole and grounded with an iron rod. Rails are 70-lb., ties are standard white oak, and six-bolt fish-plates are used at the joints, with 8-in. 0000 Ohio Brass copper bonds. The trolley is 0000 grooved.

ROLLING STOCK

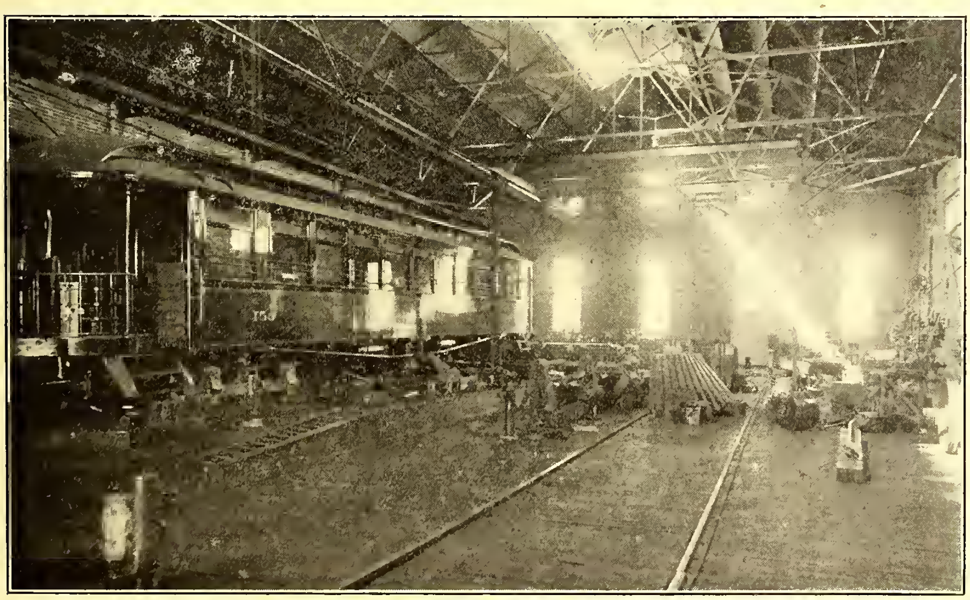
To provide for the extension, the company bought four sixty-passenger coaches and one freight car built by the Jewett Car Company, of Newark, Ohio. The passenger cars, which have three compartments—baggage, smoker and passenger—were described in the July 2, 1904, issue of this paper. The cars are used interchangeably with those of the Columbus, Buckeye Lake & Newark Traction Company, and all cars run through to Zanesville, giving hourly headway. As outlined in an article on "Limited Service and Interline Business," in the issue of Feb. 1, the companies operate limited cars between Columbus


A VIEW OF THE BOILERS, SHOWING THE FUEL GAS SUPPLY PIPES

and Zanesville, giving two trips each way a day. For this service is used a fine 55-ft. chair car built by the Barney & Smith Car Company. The aisle is at one side of the center, and there are two rows of chairs on one side and one on the other, thus giving a maximum seating capacity of thirty-three passengers in the car. The rear end has an observation extension and a dozen passengers may be seated on camp stools; this space may be also used for carrying baggage. Excess of 15 cents to Newark and 25 cents to Zanesville is charged, and the cars are well patronized. It is probable that another car will be installed and the service increased to four daily trips each way.



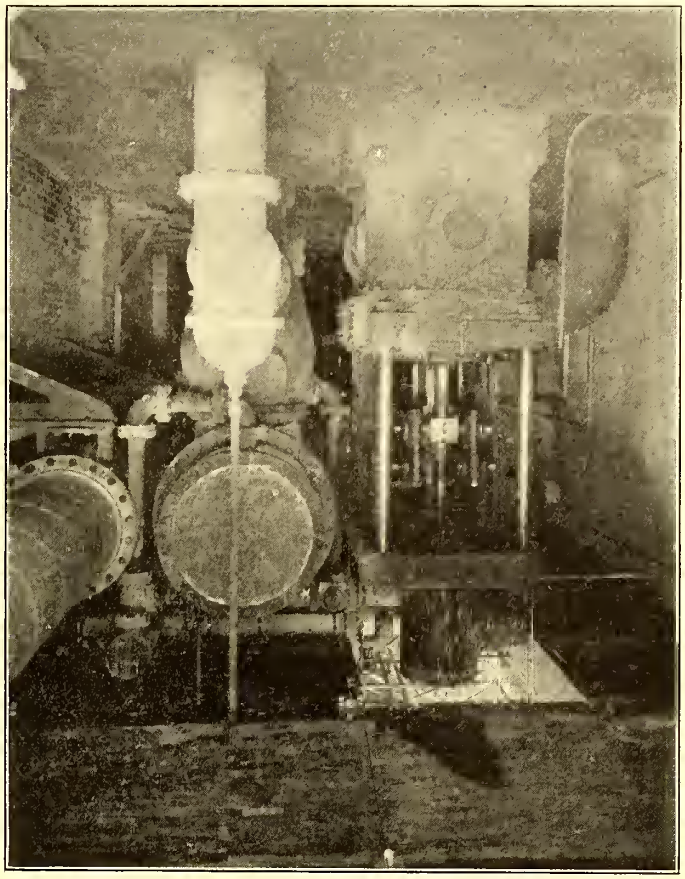
THE 2500-HP GENERATING SET INSTALLED IN THE HEBRON STATION



INTERIOR OF THE NEWARK CAR SHOPS, SHOWING THE EXCELLENT LIGHTING ARRANGEMENT

POWER STATION AND DISTRIBUTION

The Hebron power station of the Columbus, Buckeye Lake & Newark Traction Company was enlarged to provide power for the new line. The old equipment consisted of two 800-kw generators operated by Hamilton-Corliss cross-compound engines. To economize space it was decided to install a vertical unit having a capacity about equal to that of the other two machines. The building was extended 40 ft. and built with a monitor roof. The engine is a Reynolds-Corliss vertical cross-compound type built by the Allis-Chalmers Company. The cylinders are 34-in. and 68-in. x 48-in. stroke, and the engine revolves normally at 98 r. p. m. The fly-wheel is 20 ft. in diameter and weighs 125,000 lbs. The shaft is 26 ins. at journals and 29 ins. at fly-wheel. On the shaft is a General Electric revolving-field type 1500-kw generator, producing alternating current at 13,200 volts. The engine has Reynolds-Corliss automatic valve gear, with double eccentrics on both sides for operating steam and exhaust valves independently. The main bearings are water-jacketed. The eccentrics are encased and oil drips over them. Automatic sight-feed lubricators lubricate the cylinders and exhaust valves. There is a safety stop governor which operates on the throttle at 8 r. p. m. over speed. The speed variation is guaranteed not to exceed $2\frac{1}{2}$ per cent when working at any range between minimum and maximum speed. The guarantee provides that when the engine is running 94 r. p. m. with 150 lbs. steam at throttle with condenser maintaining



THE CONDENSER AND AIR-PUMP APPARATUS FOR THE 2500-HP ENGINE

26 ins. vacuum in low-pressure cylinder, that it will require not more than 13 lbs. steam per indicated horse-power per hour when developing 2300 hp, not including steam for the condenser. The engine will develop 3500 hp maximum. The condenser system was kept separate from that of the old portion of the house. The condenser is a Blake vertical twin jet condenser, steam cylinder 16 ins., water 40 ins., with 21-in.

THE REPAIR SHOP AND CAR HOUSE AT NEWARK

stroke, and is designed to give 27 ins. vacuum. There is a primary heater between the exhaust and the condenser. Between the engine cylinders is a reheater receiver with a capacity approximately one and a half times that of the low-pressure cylinder. The exhaust to the atmosphere is provided with a 26-in. hydraulic relief valve. Spiral riveted pipe is used for the exhaust line.

Two 310-hp Sterling water-tube boilers were installed to take care of the new engine. Natural gas is used for fuel, the furnaces being fitted with Gwynn gas burners. Each member consists of two tubes, one inside the other, with perforations on the inner tube. The arrangement gives the gas a rotary motion, and the air and gas are thoroughly mingled. Both the air and the gas can be regulated. Owing to the low cost of fuel, gas at 8 cents per 1000 cu. ft., the excellence of the equipment and careful management, the Hebron station has been considered one of the most economical interurban stations in this district. The advantages of a larger output with but comparatively little increase in labor, together with the superior efficiency of the new unit, has brought the cost of current down considerably lower than it was before. The following statement for August, 1904, was before the new unit was installed, and the second statement is for January, 1905:

AUGUST, 1904

Total generated output kw-hours	609,210
Total gas used, cubic ft.	29,256,300
Cost of gas used	$2,340.50
208 gallons cylinder oil at 49½ cents	102.96
248 gallons engine oil at 18 cents	44.64
250 lbs. waste at 5¼ cents	13.12
Repairs and supplies	21.00
Pay roll	492.00
Total	$3,014,22
Cost per kw-hour	.00494

JANUARY, 1905

Total generated output kw-hours	586,504
Total cost of gas used (21,020,000 cu. ft.)	$1,681.60
260 gals. cylinder oil, at 44 cents	114.40
118 gals. engine oil, at 18 cents	21.24
203 lbs. waste, at 5¼ cents	10.65
100 lbs. rags, at 3 cents	3.00
Repairs and supplies	53.98
Water for steam and condensers	41.66
Pay roll	555.00
Total	$2,481.53
Cost per kw-hour	$.0042

NOTE—In previous report cost of water was not figured.

In providing current for the extension, a sub-station outfit was installed in a new car house erected at Newark and a substation built at Pleasant Valley. The general scheme is the same in both places, the high-tension lines entering through a tower and passing down over a tubular rack through hand-operated oil switches. Each station has two 300-kw General Electric rotary converters of the standard type; two 330-kw air-cooled transformers, reducing the current from 13,200 volts to 370 volts, with reactive coils for each; two Buffalo Forge Company's fans driven by 2-hp induction motors, together with necessary switching apparatus. The basement below is sealed off for an air chamber for cables and for ventilation of rotaries and transformers.

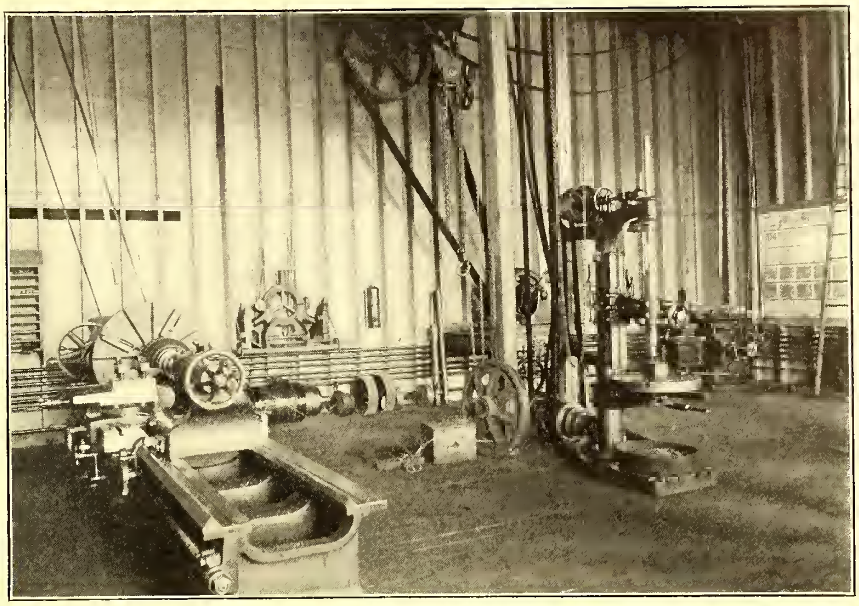
POWER HOUSE, REPAIR SHOP AND EQUIPMENT

The preliminary plans for the car house and repair shop were given in our issue of Aug. 1, 1903. Exterior and interior views of the building are shown herewith. It is designed to take care of both the city and inter-

ARRANGEMENT OF DESPATCHER'S TELEPHONE BOARD

urban cars. The wing at the right contains the sub-station, stock room, lounging room, lockers and bath for employees and offices of master mechanic and superintendent. The repair shop is on the right and the car house on the left.

The repair shop is divided about the center with a brick wall and fireproof doors, and the front portion has three pits for pit work and a wash rack for car cleaning. In the repair shop section is a transfer table connecting three tracks. In one of these tracks is a 75-ft. pit, on either side of which are 2-ton Garry Iron & Steel Company's pneumatic air lifts, so that the end of the car can be raised and the trucks transferred to another track for repair work. Covering the other two tracks with a range of about 50 ft. is a 2-ton hand crane, with an air hoist, built by the Chicago Pneumatic Tool Company. In one corner is a forge with cement floor around it. Adjoining is a J. T. Sheafer 150-ton wheel press. A 20-in. American drill press is next to this, and the two are driven by a 5-hp motor. The drill press is used for small shop work and saves interrupting the machine shop men. A swinging crane serves the drill press and wheel press. It was originally intended to place all tools in this shop, but it was found more desirable to partition off a room from the corner of the car house and do all machine work here. A line shaft extends through the center of the shop and is operated



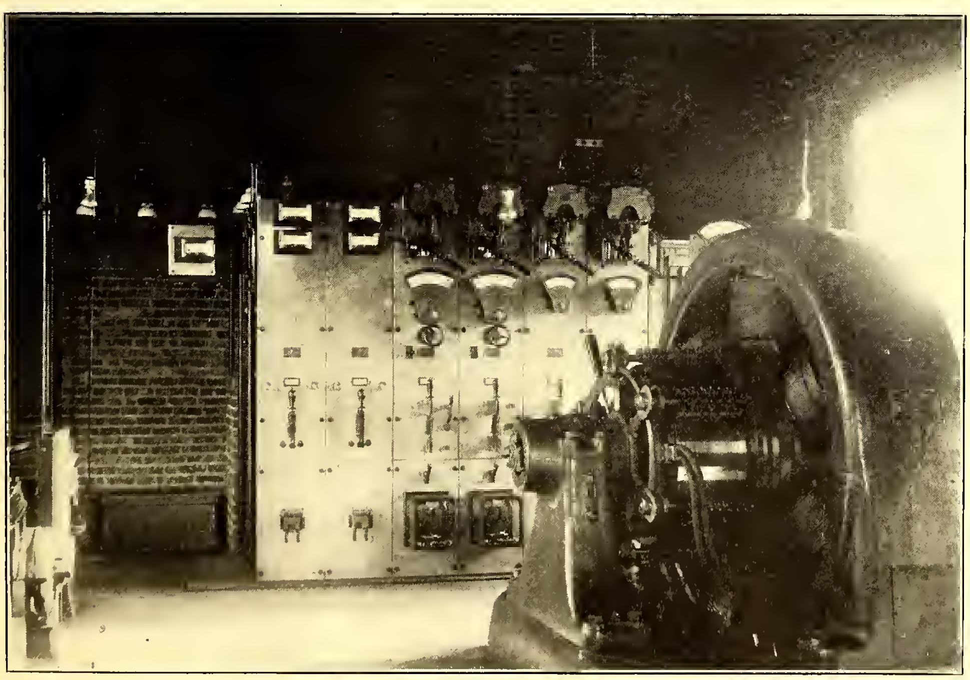
AN INTERIOR VIEW OF THE MACHINE SHOP, SHOWING MODEL ARRANGEMENT OF TOOLS AND SYSTEM OF ELECTRICAL DRIVING

THE PLEASANT VALLEY SUB-STATION

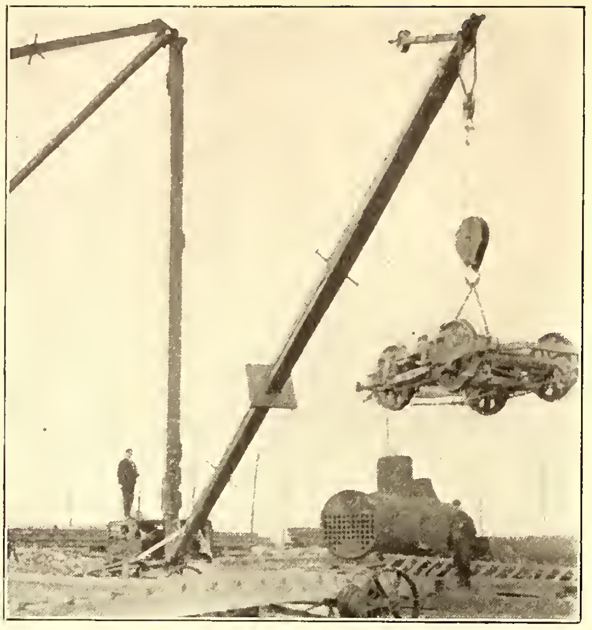
by a 30-hp Crocker-Wheeler motor, all machinery being operated by this. The equipment includes a 36-in. x 16-in. engine lathe built by the Springfield Machine Tool Works, Springfield, Mass., used for wheel turning, armatures, axles and all heavy work; a 28-in. American Tool Works' shaper; a 16-in. x 8-ft. American Tool Works' lathe fitted with quick-change gears; a 28-in. American drill press; a hack saw; a No. 10 Wells Brothers' nut and bolt machine for tapping and threading pipe; a grindstone; a Yankee drill grinder, and an emery wheel. On a shelf is a 4-ft. x 16-ft. tank supplied by a D-4 Christensen compresser outfit, the same as used on the cars, which supplies air for the hoists and for blowing out armatures and car seats. The machine shop is served by a 1½-ton chain hoist. There is a small paint shop outside, but no woodwork is done, as the shop is but a short distance from the plant of the Jewett Car Company, where it can have all work of this character attended to without delay. The plan of eliminating the woodworking and paint shops from the main building, of course, reduces insurance.

The company uses a trolley wheel supplied by the Edna Smelting & Refining Company, Cincinnati, and gets from 3000 miles to 3500 miles on high-speed interurban service. Oil and waste lubrication is used for the armature bearings, which average 160,000 miles. Solid steel gears weighing 240 lbs. are used. The company has been using steel-tired wheels with tires 2½ ins. thick, which have been giving from 30,000 miles to 40,000 miles without requiring returning, and which have a life of about 140,000 miles. At present, tires 3½ ins. thick are being put on to allow five turnings. Diamond S brake-shoes are used on steel tires, giving a life of from 18,000 miles to 20,000 miles.

A rather novel line car has been built recently by the Jewett Car Company. It has a substantial body 35 ft. over all, and has a 3-ft. 6-in. door on either side at a corner, and a door at each end, so that poles and line material can be carried. A tower in the center is fitted with a



THE PLEASANT VALLEY SUB-STATION OF THE COLUMBUS, NEWARK & ZANESVILLE ELECTRIC RAILWAY



MOTOR-DRIVEN DERRICK LIFTING CAR TRUCK

sliding table and provided with a pivoted searchlight of high power to locate wire troubles at night.

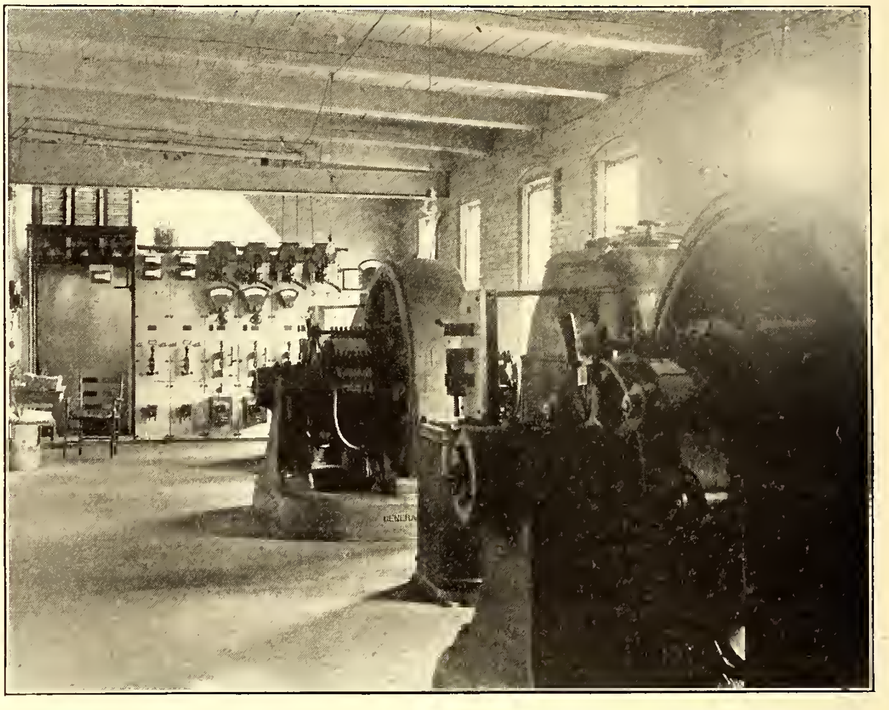
DESPATCHING SYSTEM

The despatching system has recently been improved. A 20-drop switchboard, built by the North Electric Company, of Cleveland, has been installed in a special room in the general offices at Newark. The Columbus division has one line, the Granville spur line another and the Zanesville line a third. In addition to the telephone boxes at sidings, the operator has communication with all sub-stations, freight stations, ticket offices, car house, repair shop, superintendent's office, superintendent's house and an emergency 'phone. The board is equipped with a night bell, and when a drop falls this bell rings until the drop is raised. The standard despatcher's sheet is used. Cars must have clearance orders at terminal points, and if on time they do not call for orders unless the block is against them or if it fails to light. The United States block signal system is used at all sidings. Sub-station attendants report all cars as they pass, and have a block signal to stop cars. Orders are written on a manifold blank, three copies being made, one for each of the crew and the third is dropped in a box provided for the purpose. Orders are collected at regular intervals and checked with train sheets.

GENERAL

The company is preparing to erect a seventy-five-room hotel with all modern conveniences at Buckeye Lake at the park of the same name near Hebron. This resort, which the company is making immensely popular, was described and illustrated in the previous article on this system.

The engineers for the power station were Sheaff & Jaastad, of Boston. Acknowledgment is due to J. R. Harrigan, general manager, and A. M. Frazee, superintendent of motive power of the system, for the details of the improvements. The Zanesville line, as well as the balance of the system, was built by the Great Northern Construction Company, of which C. A. Alderman is chief engineer.

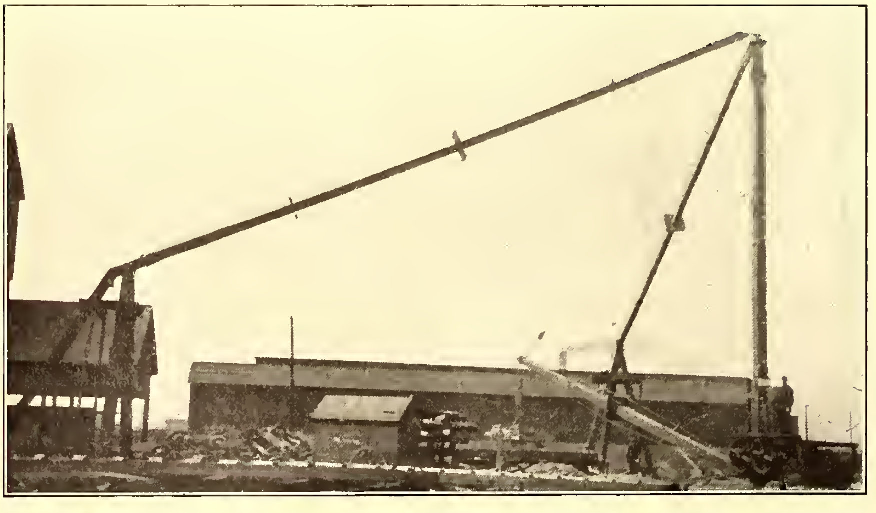


INTERIOR OF THE SUB-STATION ROOM AT THE NEWARK CAR HOUSE

MOTOR-DRIVEN DERRICK IN DETROIT

Through the courtesy of John Kerwin, superintendent of tracks, Detroit United Railway, the accompanying views of a motor-driven derrick are shown. The derrick is used at the yards of the Detroit Company for hoisting heavy material, as trucks, etc., and finds its particular application in unloading material from steam railroad flat cars, in which work it has made itself indispensable.

The derrick is operated by a 30-hp type "D" steel motor, and is capable of hoisting 7 tons at the rate of 60 ft. per minute. The hoisting machinery is connected to the mast of the derrick and travels on a circular track. There is a pinion underneath which meshes into a large bull-wheel that is fastened to the foundation and serves to swing the derrick. All the levers are on the platform above the drums. There is one lever for hoisting the boom, one for hoisting the load and one for handling the reversible gear for swinging the derrick. The mast is 45 ft. high and the boom is 58 ft. long.



THE MOTOR-DRIVEN DERRICK AT WORK IN THE YARDS OF THE DETROIT UNITED RAILWAY

It will be noticed the mast is braced by means of two heavy beams reinforced by truss cables, and there are no guy ropes, as these would be in the way in yards of this nature.

IS A UNIVERSAL TYPE OF RAILWAY MOTOR ADVISABLE?

BY A. H. ARMSTRONG

Electric railway engineering has been referred to as being a case of following the fad or fashion in vogue at the time, and many installations would seem to bear testimony to this accusation. Undoubtedly there are many cases of Jones purchasing a given motor because Manager Smith has been having good results with the same motor on his road, entirely ignoring the fact that the operating conditions upon the two systems may be totally dissimilar.

When the need was felt for a generating and distributing system of wider scope than the d. c. 600-volt system, thus giving rise to the development of the rotary converter, it was thought the converter system was proposed and installed in many instances because the tide of railway engineering fashion was turning in that direction, rather than on account of its superiority over the d. c. system. While some managements have been slow to avail themselves of the advantages of a. c. generation and transmission for this reason, it is a noteworthy fact that d. c. systems continue to be replaced by the a. c., but no instance has come to the writer's notice of the management of a road abandoning the a. c. transmission system after trial and readopting the d. c. system as being superior.

The introduction of high potential a. c. transmission to the rotary converter made possible the suburban and interurban electric roads of to-day, and greatly broadened the possibilities of electric railroading. In the development of the single-phase a. c. motor, now in successful commercial operation, we have a new influence at work of a far-reaching character. As the field of the railway motor has expanded, so the requirements of the motive power have become so varied as to make it difficult for any one motor system to meet successfully all the conditions imposed. The d. c. series motor is a highly developed and efficient piece of apparatus, and, moreover, very adaptable to the diversified character of general railway conditions. The large sums spent in developing the different types of alternating-current motors are not due to any dissatisfaction with the direct-current motor as such, but because it has become necessary to reduce the cost of the secondary distribution system, which is still high with direct current, even with the advantage of the rotary converter. The advantages of high potential transmission are now evident to all, and it is proposed to carry this advantage still further, reduce the cost of the secondary distribution by raising the potential and dispense with the rotary converter.

The case is not quite analogous to the introduction of the rotary converter, as the adoption of the latter did not interfere in any way with the motive power question itself. The change from a direct-current to an alternating-current motor is more radical, and is advocated only on account of the lesser first cost of the trolley distributing system, and is not due in any way to any superiority of the alternating-current motor itself.

The alternating-current single-phase motor with its attendant step-down transformer constitutes a heavier, more expensive and less efficient equipment than is offered by the direct-current motor with the series parallel controller. The alternating-current motor is also less flexible in its design, gives a pulsating torque and is restricted to a commutator potential of about 200 volts, but, nevertheless, its adoption for certain classes of railway service may be well justified. The car equipment constitutes but one link in the system of transmitting power from engine to car axle, and while the limitations of the alternating-current motor are regrettable, they do not in every instance introduce objections sufficiently serious to outweigh the considerable reduction in expense of the distribution system which the adoption of the high potential trolley affords. Limitations in design are reflected in the cost and bulk of the apparatus employed, but the copper and sub-station economy effected by the use of a 3000-volt trolley may outweigh the extra expense of installing an alternating-current car equipment for certain classes of service.

Perhaps it is too early in the history of the alternating-current railway motor to attempt to define its precise field of usefulness, but some of its advantages as well as some of its limitations stand out so prominently as to make possible some general comparisons with its direct-current competitor.

Both the single-phase commutator and three-phase induction types of motor have been proposed for city service. This class of service demands frequent stops and high schedule speed, thus calling for successive overloads on the motors in order to obtain the high rates of acceleration required. The schedule speed of frequent stop service is always the result of a compromise between the rate of acceleration permissible without discomfort to the passengers and the frequency of stops required to pick up and drop the passengers.

The chief requirement of the motive power is that it shall be able to commutate heavy applications of current at very frequent intervals without experiencing a rise in temperature above the 65 degs. to 70 degs. C. permissible with reasonable life of the insulation. The method of control must permit of a high "efficiency of acceleration"—that is, all losses external to the motor, such as starting resistance losses, must be eliminated so far as possible. The requirements for frequent stop service are most exacting upon the motive power and its control, and the direct-current series motor and series parallel controller may be looked upon as the survival of the fittest, having proved superior to the horse, cable and steam locomotive for such work.

The three-phase induction motor has been proposed for rapid transit frequent stop service, but has fortunately never had an opportunity to demonstrate its unfitness for the work. Aside from the complication of double-trolley construction in cities, the induction motor system is inherently inefficient during acceleration, even though concatenation of motors be resorted to. Being a motor of synchronous characteristics, no motor curve running is possible, and the external resistance losses during acceleration or fractional speed running are necessarily large. The absence of the commutator does not compensate for the extra energy consumption required with induction motors operating on frequent stop service, due partly to the poorer efficiency of acceleration compared with that possible with direct-current motors, and partly due to the increased weight of the induction-motor equipment itself. The induction motor is inherently a constant speed, constant duty motor, and does not possess the qualifications of a successful motor for rapid transit service.

The single-phase commutator motor possesses all the advantages of variable speed characteristics enjoyed by the direct-current series motor, which, together with the possibilities opened up by potential control, led to many predictions being made that the direct-current motor was destined to be superseded for frequent stop service. An examination of the efficiency curves published of the single-phase motor indicate a curve rising rapidly at light loads, but drooping on overloads, the qualification of a motor adapted to infrequent stop service. In accelerating, the larger part of the motor duty is performed on the drooping portion of the alternating motor efficiency curve, thus giving rise to an internal motor loss considerably in excess of that experienced by a direct-current motor with its sustained high overload efficiency. In order that the single-phase motor may dissipate this excess energy loss without an injurious temperature rise, it is necessary to increase its weight and bulk in proportion. As an example, a comparison may show that the average efficiency during acceleration may approximate 85 per cent with an a. c. motor and 90 per cent with the d. c., thus calling for an alternating-current equipment weighing fully 50 per cent in excess of the standard direct-current equipment, making the broad assumption that each type of motor can dissipate equal losses per square inch of radiating surface for the same temperature rise. While the alternating single-phase motor can be built to commutate successfully the heavy starting currents required in accelerating, the extra weight and cost of the equipment is a serious handicap in a class of service where the frequency of cars makes the cost of the rolling stock a matter for earnest consideration. The single-phase motor has thus far shown no indication of being superior or even equal to the direct-current motor, and when operated with an equal trolley potential seems to offer no advantages warranting its adoption. The direct-current motor is capable of being built for any potential considered safe for city or urban operation, and provides the lightest, cheapest and most efficient equipment yet developed for a class of service requiring frequent and rapid acceleration of the moving units. Continued development may bring the single-phase motor to a degree of perfection where it will compare favorably with the direct-current motor, but even so, the alternating-current motor system is permanently handicapped by higher track resistance and higher maximum trolley potential for the same average, still retains the commutator, while our experts leave us in doubt about its completely curing the electrolysis evil.

Where the use of a high potential trolley is permissible and stops are infrequent, conditions obtaining upon our private right of way suburban systems, the single-phase motor system offers claims for recognition which cannot be ignored. The success of our electric roads and the demand for better facilities has led to the introduction of heavy cars operating at such high schedule speeds that the cost of the trolley or third-rail distributing system has become a serious item, even with the advantage of the rotary converter fed from a high potential transmission line. Just as our city railway systems exceeded the economical limits of direct-current distribution, so are our large long-distance electric roads demanding a higher potential than can be furnished by direct-current generation and used by the subdivided motive power on a car. A 1200-volt d. c. system offers relief in this direction, and in some instances may prove of considerable value in solving the problem of a cheaper secondary distribution system. There is also the possibility open of using three-wire systems with 600 volts or 1200 volts on a side, so that we have not as yet reached the limits of d. c. distribution. Any considerable increase of potential over the 600-volt systems now in use necessitates abandonment of the third rail and the adoption of some overhead third-rail or trolley construction. Although it may be possible to design certain constructions of protected third rail which can be used for more than 600 volts, it is probable that high-voltage systems of the future will be compelled to use overhead construction.

The synchronous characteristics of the three-phase induction motor debarred this type of motor from the suburban field with its broken profile. The single-phase commutator motor, however, adapts its speed to the grade, and in this respect is equal to the direct-current series motor, while the use of potential control gives the opportunity of continued operation at any speed called for by the profile of the road without impairing the efficiency of operation. With infrequent stops, the heating due to accelerating losses is minimized, while the efficiency of the motors during free running is excellent.

While the single-phase motor appears limited by the low-voltage commutator and other considerations to a moderate output, it has been developed in capacities large enough to meet the requirement of single-car suburban service. Recognizing the necessity of terminal operation over city tracks equipped with direct-current trolley, the manufacturers have brought out alternating-current railway equipments capable of both a. c. and d. c. operation, thus providing a system of great flexibility and one well adapted to avoid conflict with existing systems. Thus, while the single-phase motor equipment offers no assurance of better or cheaper operation, it does permit of a considerable reduction in the first cost of installing a suburban system operating single cars on private right of way, where the use of a high potential on the trolley is permissible.

The successful operation of high potential trolley roads has made it possible to consider the equipping of certain sections of our steam roads now using the steam locomotive under conditions unfavorable to its economic operation. The conditions imposed by the different problems presented again call for qualifications not possessed by any one single electric system. The steam road operator has found it necessary to divide his system into sections, design his locomotives for local conditions and proportion the tonnage of trains according to the profile. So the system of electric operation well adapted to take care of the needs of one section of the road may fail to respond to the requirements of another section, thus emphasizing the necessity of adapting the motive power to local conditions.

Electrical engineers are able to produce a successful system of operation for even the heaviest character of railroad service, but rather disagree upon which method of operation is most economical and can be installed for least expense. Undoubtedly, this apparent lack of agreement is brought about by the attempt to reconcile engineering recommendations made where the operating conditions are widely different. Thus, the induction motor is well adapted for haulage work where the profile is regular, either level or a continuous unbroken grade, but the locomotive so equipped makes a poorer showing over a road having a broken profile than would other types of motors having good variable speed characteristics.

The economies of freight haulage tell us that the lowest cost of carrying a ton 1 mile is secured by the operation of the heaviest train which the design of the locomotive and strength of the drawheads will permit. This means a much more infrequent service than that obtaining in the majority of electric roads, and seems to exclude any system of operation that does not employ a high potential trolley. The local demand for power imposed by such heavy train units operating at infrequent intervals brings the first cost of any direct-current trolley or third-rail system too high for serious consideration.

Perhaps the most vulnerable point in the operating sheet of a steam locomotive system lies in the present high cost and dangers of operating heavy mountain grade sections. Not only does the steam locomotive give poor economy and small output when working at nearly full stroke at speeds of 6 m.p.h. to 10 m.p.h., but its cost of maintenance is excessive and crew expenses high, due to the small mileage obtainable. The energy stored in lifting trains up grade is all wasted in braking coming down. This loss of energy may be partially restored with an electrical haulage system effecting an economy in the coal consumption, but more especially relieving the brake-shoes and preventing accidents from broken wheels due to overheating.

Whether the system adopted for a given installation be the single-phase commutator motor, the three-phase induction motor, or motor-generator sets on the locomotives feeding direct-current motors on the axles, will depend upon the requirements, as no one of these systems is flexible enough to meet all the conditions that may arise in an extended system. The advocates of the single-phase commutator motor must contend with the difficulties of a low-voltage commutator, pulsating torque, not very high efficiency and a preference for high rotative speeds, inherent in this type of motor. While these difficulties have been overcome and a commercially-operative system evolved for the smaller capacities of motors suitable for suburban single-car high-speed service, considerable difficulties in regard to commutation, ventilation and general mechanical design of the locomotive itself must be overcome before proposing such a radical departure from the successful designs possible with the greater latitude allowed in direct-current and induction motor design. For high-speed service on level track on the contrary, the single-phase motor may be developed for considerable output. The commutator motor, the three-phase induction motor and the various combinations of motor-generator sets may all receive power from a high potential trolley, and a judicious selection of the proper system to meet the general conditions involved seems better than a strict adherence to any one system of operation when it shows its inferiority in specific instances.

Uniformity in type of equipment is very desirable, but may sometimes be purchased at too high a cost, and the best interests of a large electric railroad system are conserved by properly adapting the motive power to the requirements of the different sections.

CAR VENTILATION

BY EDWARD TAYLOR

Inasmuch as there has been a considerable amount of agitation recently as to whether the cars of certain electric railway systems were properly and sufficiently ventilated, and in view of an editorial in a recent issue of the Street Railway Journal, calling attention to the lack of literature on this important subject, the writer thought that perhaps it would be advisable to make public certain information and data that he has acquired while investigating the conditions on an important city electric railway system. The observations should be of interest to any one concerned with the proper ventilation of rolling stock equipment. The method of testing hereafter described, while readily understood and carried on by railway men who have no knowledge of chemistry, is nevertheless based on certain laws of that branch of science, and if carefully pursued can be depended upon to give reliable results.

Before entering into a discussion of the methods of testing the efficiency of ventilation, it should be of interest to look into the causes of the recent increase in complaints on the part of the public and health officials, in so many of our cities, against the poor ventilation of street railway cars. Until quite recently the standard construction of such cars rendered the discussion of ventilation unnecessary, as the "monitor" construction of the roofs, with the liberal space provided for dome sash windows, afforded the most thorough renewal of the air within the cars. But within the past year or two local conditions of operation, on certain roads, have made it advisable to change the construction of their cars, and as a result the managements have had their attention called by the health departments of their respective cities to the fact that insufficient ventilation was provided for on their equipment. Upon this condition arising, certain companies sprang into existance, having for their object the manufacture of various devices which, it is claimed, will afford a means for putting an end to this trouble. The most common of such devices is based on the idea that the velocity of a car when in motion will project a current of air into its interior through an opening provided with a wing deflector, by which the amount and direction of the current may be regulated. The wing is so located as to create a partial vacuum on the side opposite to that which is deflecting air into the car, thus affording an exhaust and consequent circulation of the car's atmosphere.

Although the writer has tested a number of these devices, and is familiar with the advantages and defects of the most important makes, he will not speak of them in this article, as he desires not to explain means for alleviating trouble with ventilation, but to point out a method of ascertaining if trouble actually exists in any local case. A simple and practical test, that involves no expert knowledge and no elaborate equipment apparatus to carry about, should be of the greatest importance to every road, as should poor ventilation exist it is far more advisable to correct the condition at once than to wait for the publicity and annoyance connected with an order from the authorities. And, furthermore, in case, as often occurs, a complaint is made without just grounds, a ready and reliable method of demonstrating the efficiency of the car ventilation may prove of considerable benefit.

On the principle, however, that "an ounce of prevention is worth a pound of cure," it seems to the writer that a broader scope of knowledge on this subject by those responsible for the design of cars might cause more intelligent means of ventilation being provided in the construction of the same. For this reason we will briefly consider what is meant by "good ventilation." Fresh country air, which is always considered the standard for all comparisons, consists of practically 21 per cent of oxygen, 79 per cent of nitrogen and a very minute fraction of a per cent of ammonia and nitric acid gases, together with organic and inorganic matter held in suspension, the exact amounts of each constituent depending upon the local conditions; a certain amount of water or aqueous vapor is always present, varying with climatic conditions, and there is, further, a fairly constant proportion of carbon dioxide, or carbonic anhydride, of from 3 to 5 parts in 10,000 parts of air. A very slight increase in the relative amounts of certain of these constituents, particularly in the carbon dioxide, and in the organic matter, protoplasm, bacteria (or germs, as it is variously referred to), produces the condition of a vitiated atmosphere or impure air. As, however, it has been found that the increase of any impurities in the atmosphere is almost invariably accompanied by a corresponding increase in the amount of carbon dioxide, and as this gas is most easily detected and its amount readily determined, the proportion of carbon dioxide to the total body of air has been agreed upon as an index to the degree of impurity of the air.

This does not necessarily mean to imply that carbon dioxide is the most deleterious element in the atmosphere. On the contrary, amounts of carbon dioxide far in excess of that contained in what is considered very foul air can be introduced into any body of air, without injurious results, if it is unaccompanied by the other elements commonly found with it. For instance, air containing from 20 to 30 parts of carbon dioxide in 10,000 is considered, as a rule, to be very impure, and under ordinary conditions would prove highly injurious, but as high as 700 to 800 parts in 10,000 is often found in mines, an amount sufficient to extinguish a flame, but in which the miners have remained for a long period without injury. But, in general, in buildings or vehicles where the fouling of the air is caused by respiration or combustion (either of stoves, furnaces or lights), the increase in the amount of carbon dioxide, taken as an index, must be kept within narrow limits, or positive injury to the inmates will result.

According to the most careful investigators, it may be said that air containing above 10 parts of carbon dioxide in 10,000 ceases to be pure, and the degree of harm that any percentage may produce will depend chiefly upon the time that any person is compelled to endure it. As the effect of impure air is cumulative rather than immediate, except in the most extreme cases, a person of sound health could endure even as high as 40 parts in 10,000 for some time without any serious or permanent ill effects. But where, as in the tenement houses of large cities, which are notoriously poorly ventilated, the foul air must be endured for long periods by the inmates, their health invariably suffers, and to this fact may be laid a part of the high rate of mortality of persons compelled to live and sleep therein. Cases coming under the writer's own observation in such quarters gave as high as 33 parts of carbon dioxide in 10,000, a condition that could be endured for short periods with impunity, but for a living atmosphere is exceedingly dangerous.

But owing to this cumulative effect, ventilation is a relative term, and "good ventilation" may have a number of meanings, depending on what is being referred to. A sleeping room or hospital should have facilities for introducing enough air to keep the percentage of carbon dioxide below 10 parts in 10,000. In schools, public halls or theaters it is quite permissible to have the amount rise to 14 or 15 parts without injury to those in their interior, as the time to which a person is exposed to the impure air is comparatively short. On steam railway cars, and those of interurban lines, where long runs are made and individual passengers may remain several hours in the car's atmosphere, about the same degree of ventilation would be required as in public buildings. But in ordinary street railway traffic where from one-half hour to one hour is nearly the longest ride of a passenger, a higher amount of carbon dioxide might be introduced into the atmosphere without any injury to the passengers resulting, and it is the writer's opinion that 20 parts of carbon dioxide in 10,000 would not be excessive under these circumstances; or in other words, that a ventilation that will keep the carbon dioxide from rising above that proportion may be considered entirely sufficient.

It may be asked why the higher standard is not demanded in spite of the time that passengers remain in the cars. Theoretically, all ventilation should reach the highest possible standard, but it must be remembered that on railway cars the lowness of the roof, and the small air space per passenger, as compared with buildings, necessarily resulting from the design of cars, which must have as little clearance and wind friction as possible, renders it impracticable to very thoroughly ventilate crowded cars without subjecting the passengers to disagreeable drafts that would be more injurious than a slight excess of impure air.

In order to keep from exceeding the proportion of carbon dioxide previously mentioned (20 parts in 10,000), it will be necessary to introduce a certain amount of fresh air per hour or per minute into the car, the exact amount depending upon the number of passengers, and if other than electric lights are employed, upon their size and number. As, however, the greater portion of modern street railway equipment is both heated and lighted electrically, giving rise to no products of combustion within the car, the effects of the respiration of the passengers need alone be counteracted by the ventilation. Whenever a number of persons are gathered together in a poorly ventilated apartment, the air soon becomes oppressive. This is partly due to the excess of carbon dioxide, as a man exhales about .62 of a cubic foot of carbon dioxide per hour, but it is chiefly caused by the large amount of moisture or aqueous vapor which is given off from their lungs, which, suspended in the air, causes a heavy or oppressive feeling. The micro-organisms or bacteria contained in such air are also found to be unusually high. The presence of moisture in air, causing a feeling of suffocation among the passengers, is shown by the dull sensation usually felt in well-warmed cars unless exceptionally well aired, and the non-observation of this on comparatively cold cars. To keep these products of respiration from accumulating to dangerous limits, a certain amount of fresh air per person must be introduced. The exact amount depends partly upon the cubic feet of air contained in the car, but in general 353 cu. ft. of fresh air per hour, or 5.89 cu. ft. per minute, should be introduced per passenger, in order that the percentage of carbon dioxide may not rise above the point specified.

We can now discuss, therefore, the first points that must be considered in the making of a test to determine whether the facilities for ventilation on any specified car will be sufficient. As a rule, the first problem concerns the number of passengers for whom ventilation shall be provided. It is obvious that the maximum standing load cannot be used as a basis, as a car well ventilated when crowded with passengers would necessarily have currents of air sweeping through the car with uncomfortable and dangerous velocity. Repeated tests on cars upon various lines have shown that cars in all day service carry less than their seating capacity on an average, and the writer considers that if ventilation is provided for the number of passengers that can be seated, the best results will be obtained. Presuming that the car in question will seat fifty-eight passengers, 341.6 cu. ft. of air per minute should be admitted, either continuously or on an average.

In making a distinction between continuous or average air supply, it must be remembered that car ventilation is, as a rule, intermittent. The air coming in through the ventilators or dome sash windows, and through the cracks in the doors, etc., is what must be depended upon for ventilation during the time the car is in rapid motion, and, as a rule, only during such time does air in any appreciable quantity enter the car in this manner. But immediately preceding a stop, and during the stop, one or both end doors of the car are thrown open, admitting a large volume of air, the exact amount being indeterminate, in view of the fact that variable conditions, such as the temperatures inside and outside the car, the direction and strength of the wind, etc., are functions of the calculation. This item can usually, by approximation and experiment, be closely estimated, but all conditions must be considered if reliable results are to be obtained.

Assuming, though, for illustration, that a door has an area of 15 sq. ft. and that the inrush of air throughout the time it is open has 3-ft. per second velocity, there will be a displacement per second of 45 cu. ft. of fresh air. If the doors are open for twenty seconds, which is not far from the average figure in service, 900 cu. ft. of fresh air will have been introduced. Again assuming that during the running time there is introduced but 200 cu. ft. of air per minute, and assuming that the time between stops is five minutes, an unusually long run in city service, there would have been brought into the car during the five minutes and twenty seconds of one run and stop a total of 1900 cu. ft. of fresh air. In other words, the replacement of air would have proceeded at an average rate of 358 cu. ft. per minute, while, as before stated, only 341 cu. ft. were required to maintain an efficient ventilation.

Having outlined the general idea of what should be sought for, I will explain the details a little more fully. The exact area of all openings, doors, windows, ventilators, etc., should be carefully measured. An anemometer reading should be taken of the velocity of the air entering or leaving each such opening, both while car is at rest and while in motion. It is evident that the area of any opening multiplied by the velocity of the air current passing through the same will give the cubic displacement of air through the orifice. In all calculations, the local conditions must be kept in mind. The number of stops and length of stops compared to the running time; the point as to whether one or both doors are thrown open at each stop; on elevated trains, the difference between the air admitted on the front or rear car of the train, etc., must all be considered and the effect of each item approximated. For instance, on all lines operating three or more cars in trains, such as is the practice in elevated or subway service, it will be found that the head car of the train will be much more thoroughly ventilated than the rear car or cars. This condition is produced by the suction of air by the leading car, which reduces the flow of air through the ventilators of the middle cars, the rear car having a strong exhaust. Only the leading car receives the full pressure of the atmosphere caused by the train's velocity, consequently the following cars will have a slower rate of displacement through their front ventilators. On the other hand, the middle cars of such trains at each stop have both front and rear doors thrown open, and consequently receive a double amount of air throughout the stop.

The method outlined above of actually measuring the amount of air is open to a number of criticisms. It is difficult to carry out the readings while in actual service, and quite impossible on a crowded car. It will give a very accurate idea, if carried out on a car or train run without passengers, of what can be expected in service, but, of course, is subject to all the variations caused by local conditions.

For this reason I will explain a simple but reliable method of directly testing the air in any car under any conditions. The entire apparatus consists of five ordinary clear glass bottles and a small amount of lime water. By means of this apparatus the amount of carbon dioxide, which, as mentioned before, is considered by hygienists to be a sufficient index to the relative impurity of the air, can be determined very easily and quickly, and with sufficient accuracy for all practical purposes. One bottle should be the ordinary 1-oz. size of the drug stores, and is used for measuring the lime water. The other four should be respectively 4-oz., 8-oz., 16-oz. and 32-oz. bottles.

These four bottles are to be filled with samples of the air under question, and should be clean and dry, and fitted with dry, clean, tightly fitting rubber stoppers. Taking them into the car whose air is to be examined, they are uncorked and filled by means of a hand bulb syringe, repeatedly forcing air into the bottle until it is certain that it is filled with the car air. As each is filled it is carefully recorked and the four taken to the testing room. Into each bottle is then poured from the 1-oz. bottle 1 oz. of fresh lime water and each immediately recorked. These should be thoroughly shaken for at least two minutes and then turned upside down, allowing the liquid to run into the necks. Holding them up against a dark background it will probably be found that in one or more of the bottles the liquid has changed in color, becoming cloudy or possibly of a strong milky tinge. Should all four bottles show a color in the liquid, it indicates that the air contained above 20 parts in 10,000 of carbon dioxide, and is therefore above the safe limit of impurity. Should the three largest bottles show a milky tinge in their contents, the 4-oz. bottle remaining clear, the air contains approximately 14 parts in 10,000 of the carbon dioxide. A color in the 16-oz. and 32-oz. bottles, the two smaller remaining clear, indicates 10 parts in 10,000; and a milky liquid in only the 32-oz. bottle, the others being clear, shows about 6 parts in 10,000, or very good air. Should no trace of color appear in the liquid in any bottle, it proves that the air is practically pure, and will demonstrate ideal ventilation.

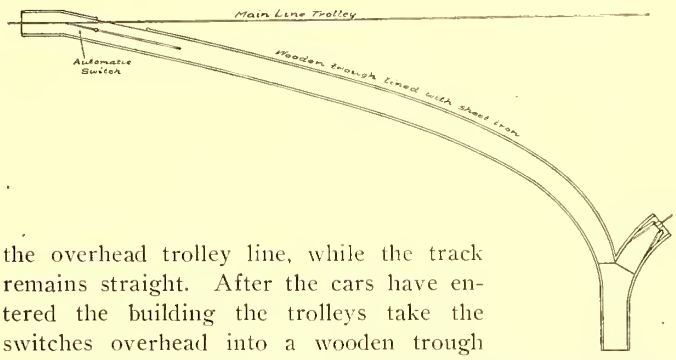
The precautions to observe in conducting this test are few, but important. The bottles should be all of very clear, white glass, and should be clean and dry. The stoppers should be tight fitting, and after the sample air is secured should not be removed for longer than absolutely necessary. Before uncorking the bottles to pour in the lime water be sure that the bottles are of the same temperature as that of the room in which they are opened; this is important, as if the bottles are warmer than the surrounding air the air in their interior will expand and a certain amount be lost when the stoppers are removed. For men unfamiliar with the effects of carbon dioxide upon lime water, it might be well to breathe a few times into a bottle before conducting the test, and shaking up with lime water in above indicated relative proportion. This will give a very strong tinge or milky appearance that will convey an idea of the effect of mixing lime water and impure air.

While this test would be considered by a chemist to be rather crude, the results, if carried out with the degree of care necessary, will prove to be sufficiently accurate for all practical purposes.

The matter of properly ventilating the passenger cars of electric railways is one that commands attention, inasmuch as sanitary conditions generally are being brought to a higher standard. New and more stringent laws are being enacted or old laws amended on the subject of public hygiene, and each succeeding head of a health department is more vigorous in their enforcement. An order from their department and the facility with which an injunction can be secured, provides an ever-ready weapon whereby a disgruntled passenger can, at the least, cause annoyance to the management of a road by the publicity which a discussion in the press of an always popular subject of this sort engenders. It is, of course, the wisest plan to anticipate such conditions by liberal provision for ventilation of the cars, but when charges are falsely made, as often occurs, the above method of testing will afford a quick and convenient method of ocularly demonstrating to the proper authorities the actual facts as they exist, without subjecting the company to the delay necessitated by an expert chemical analysis.

DEVICE FOR TURNING TROLLEY POLES

G. B. McLean, chief draftsman in the electrical engineering department of the Pacific Electric Railway Company at Los Angeles, is the inventor of a device that has been installed in the new Huntington Building in that city, by which the trolley poles of the cars are automatically turned. The invention is simple, and consists of nothing more than a "Y" formed by



the overhead trolley line, while the track remains straight. After the cars have entered the building the trolleys take the switches overhead into a wooden trough lined with sheet iron, and are completely turned around while the cars proceed little more than their own length.

This will mean the saving of much time to the Pacific Electric Railway Company in operating its cars through the new building, where they are to be switched around and started out again on their respective lines at the rate of one each minute, if necessary. With the use of McLean's invention, all the motorman has to do is to take off the levers of his controller and air brake and walk through the car to the other end. The conductor steps from the rear platform, holding the rope attached to the trolley pole, and boards the car on the other end as it passes by.

Mr. McLean has not taken out any patent on his invention and says it is not his intention to do so. When the switching system inside of the Pacific Electric Railway Company's buildings is completed it will be the most complete of its kind in the world.

The Toledo & Western Railway Company is at work on a systematic campaign for building up its freight business by inducing industries to locate along its line. During the past year it has secured two industries for Sylvania, one for Berkey, three for Pioneer and one for Blissfield. The last mentioned is an immense beet sugar plant which will give the company a large amount of business from surrounding territory, as it will have a capacity of 600 tons of beets per day. The company is planning to increase its freight car equipment and may decide to install a steam locomotive for hauling trains at night.

CENSUS REPORT ON STREET RAILWAYS—IV.

Chapter VIII. discusses the tendency during the past decade toward the consolidation of street railway companies, and refers to it as being one of the most important factors in street railway progress during the last ten years. The advantages are much more pronounced with electric traction than when animal power is used, so that in almost every great city in the United States the different properties have been brought together into one system. The increase in the importance of individual companies is brought out by the following table:

TABLE SHOWING DISTRIBUTION OF OPERATING COMPANIES ACCORDING TO LENGTH OF LINE: 1902 AND 1890.

Length of Line (Miles).	1902		1890	
	Number of Companies.	Length of Line, Miles.	Number of Companies.	Length of Line, Miles.
Under 10	394	1,957.16	557	2,304.49
10 but under 20	219	3,148.94	99	1,353.42
20 but under 30	76	1,878.54	16	400.39
30 but under 40	34	1,197.83	7	251.74
40 but under 50	25	1,117.05	4	178.04
50 but under 60	16	892.86	2	101.57
60 but under 70	12	785.22	2	130.33
70 but under 80	7	532.46	1	76.48
80 but under 90	6	515.30	1	84.42
90 but under 100	3	277.12	....	....
100 and over	25	4,349.10	2	238.65
Total	817	16,651.58	691	[1] 5,119.53

[1] Exclusive of 663.94 miles, estimated, in 1890

The report then discusses the methods of combination by merger, lease and stock ownership, and gives examples of each.

FRANCHISE, PUBLIC REGULATION AND PUBLIC OWNERSHIP

This is the title of Chapter IX., which contains a resumé, in twenty-three pages, of the laws of the different States. Only the main requirements are given, as the Census Office states that the actual regulations differ widely among the different companies in the same State, or even in the same city. The regulations between the different States also differ widely; thus, all municipal ordinances in Colorado, South Dakota and Utah are subject to the referendum and petition; in Nebraska and Arizona all public franchises in cities must be submitted to popular vote, and in Montana and Colorado to the vote of the tax-paying electors. In Iowa one-fifth of the voters in any city may require any franchise to be submitted to popular vote; in Detroit the local ordinance provides that proposed franchises shall be submitted to popular vote, but such vote is purely advisory, not binding. In California, Nevada, Kentucky and Virginia the general State laws require competitive bidding, but contain no provision specifying the character of the bids, which apparently might, at the discretion of the local authorities, be either in the form of lump sums or of annual payments. In New York and Louisiana the bids must be on the basis of a percentage of the gross annual earnings. In Ohio the franchise must be granted to the bidder offering the lowest rates of fare. A similar method is required by the individual charters of certain cities, and in a few others it has been adopted voluntarily by local authorities. The city ordinarily reserves the right to reject all bids. In Virginia the local authorities may, if for any reason they deem it to be for the interests of the people, grant the franchise to some other than the highest bidder, but they must give their reasons for the grant in the franchise ordinance.

In most States there has been as yet comparatively little experience with the working of the method of competitive bidding for public franchises. The method has, however, been employed long enough in California, New York and Ohio to afford a fair basis for a judgment as to its success. As a rule, there is little or no competition for the franchise, so that the result is not very satisfactory. The report discusses this condition at some length, and states that the best results are secured where the system of competitive bids is supplemented by careful bargaining on the part of the local authorities. This method is provided for in the charter of New York City.

There is an equally wide variation in regard to duration of franchises. Most States, including those which limit the duration of corporate charters, provide in their constitutions that the Legislature shall have the right to repeal or amend any general or special incorporation law if passed subsequent to the adoption of the constitution. This provision has been inserted in view of the judicial doctrine announced in the famous Dartmouth College case that, in the absence of such provision, an act conferring privileges upon a private corporation constitutes a contract on the part of the State. It is probably safe to say that nearly all important street railway companies in the United States hold charters which are either limited in duration or subject to amendment or repeal by the State Legislature. In case of such amendment or repeal, however, the courts are disposed to require that regard be given to vested property rights, and the Legislature is subject to limitations in those States whose constitutions prohibit special and local legislation, and in which, accordingly, changes must apply to an entire class.

Many street railway franchises, particularly those of early date, are perpetual, and there is no State or local provision under which they can be revoked or amended. Where, however, a corporation whose charter is subject to revocation or amendment holds such an unlimited franchise, the State Legislature can virtually annul it, or change the terms of the franchise, through its control over corporate existence. Even if both the charter and the franchise of a public service company are unlimited in duration, the State may, subject perhaps to certain self-imposed limitations, exercise, directly or through local governments, its right of eminent domain to purchase the property for public use. The payment in such a case would ordinarily include not merely the tangible value but the full franchise value.

Franchises which are perpetual, and not subject to modification by the local authorities, are still permitted by the State laws of New York (except as regards certain cities), New Jersey, Pennsylvania, Missouri, Indiana, all of the New England States and a few others. Many of the most important franchises in the largest cities of the country are perpetual and cannot be modified by the local governments. In a majority of States the present policy is to limit the duration of street railway franchises by State law. The limit of life is ninety-nine years in Louisiana (the law applying only to parishes), fifty years in Arizona, Idaho and second-class cities of New York, and by special act (the constitutionality of which is in litigation) in Cincinnati, Ohio; thirty years in Michigan, Virginia, Alabama and Florida; twenty-five years in Ohio, Iowa (in cities under special charters), San Francisco, Cal., St. Paul, Minn., and Portland, Ore.; twenty years in Illinois, Kentucky, Nevada, South Dakota and Montana; and ten years in Wyoming. There is apparently a tendency to shorten the duration of franchises, the more recent enactments usually prescribing the shorter periods. In many cases cities have limited the life of franchises where no State restriction existed, or have fixed terms shorter than those prescribed by State law.

The statistics as regards the compensation for franchise privileges is equally varied. License fees of one kind or another are collected from street railway companies in a large number of cities. They are particularly common in the Southern States, where licenses are commonly employed as a method of taxing all kinds of occupations. In New York, Chicago and Philadelphia the car licenses are $50 yearly, and in St. Louis, $25. In most other important Northern cities the fees are lower. In Cincinnati, at least formerly, and in one or two other places the license is based not on the number of cars, but on the total length of the cars used, the idea being that a large car should properly pay more than a small one. In some cases car licenses are based on the total number of cars owned, in others on the average number in use daily during the year. The latter method would seem to be preferable, especially where a different type of car is used for summer travel, since such cars lie idle for a good portion of the year. An objection to car licenses lies in the possibility that they may reduce the number of cars operated, to the disadvantage of the patrons of the railway. In a few States it is common for local governments to charge an annual license fee on the poles of trolley railways. This practice exists, for example, in several cities of Pennsylvania.

The requirement to pave part of the street is very common. The other most common form of special compensation is a percentage of the gross receipts. Thus, in New York City, by State law, all surface railways built after 1884 must pay at least 3 per cent of their gross receipts to the city during the first five years of their franchises, and at least 5 per cent thereafter. The rate of 5 per cent is found also in Richmond, Va.; Providence, R. I.; Newark, N. J., and one or two other cities. In Cincinnati, Ohio, the company pays 6 per cent of its gross receipts into the city treasury, and in Baltimore, Md., no less than 9 per cent, the rate in this city having been originally 20 per cent. In Buffalo the leading company pays 3 per cent. In St. Louis, Mo., varying percentages are required by different franchises. Occasionally a provision is found for an annual payment based on profits rather than on gross business. Thus, in the State of Massachusetts and in the city of Philadelphia, railway companies are required to pay a certain proportion of the excess of their dividends if the latter exceed a fixed rate. In Des Moines, Iowa, a percentage of net earnings is demanded, and in Topeka, Kan., one-tenth of the excess of net earnings over 10 per cent on the investment. In none of these cases is any important revenue derived by the local governments.

Chapter IX. concludes with a condensed digest of the State laws and local franchise regulations in the leading cities.

Chapter X. is devoted to street railways in European countries, from which the accompanying table has been prepared. The statistics not only give figures from different countries, but also from individual cities in a few cases.

Part II. of the Census Report has been prepared by Thomas Commerford Martin, and is devoted to an exceedingly interesting and valuable discussion of the mechanical and electrical status of the industry, and it is also illustrated by typical engravings of street railway apparatus and installations. This portion of the report is followed by a series of tables giving financial and other data of the different companies; bridges, feeder conduit systems, water wheels, gas engines, sub-station equipment, etc.

The system of electric traction installed in Manila by J. G. White & Company, of New York, was formally opened to the public on Monday, April 10. The general manager is Richard T. Laffin, formerly of the Worcester Consolidated Street Railway Company, under whose supervision the lines were built.

TABLE SHOWING STATISTICS OF EUROPEAN STREET RAILWAYS

Country.	Year.	Length of Line (Miles).[1]	Number of Cars	Gross Earnings (Dollars).	Operating Exp. and Taxes (Dollars).	Number of Passengers.	Car Miles.	Capital Investment (Dollars).
Great Britain and Ireland	1902	[2] 1,848	7,752	32,504,770	23,446,179	1,394,452,983	145,127,423	[3] 153,597,772
Prussia	1901	1,316	....	[4] 18,752,258	[5] 11,424,000	799,950,000	[4] 140,359,006	[6] 115,045,154
Germany, excluding Prussia	1901	1,867	....	[7] 29,535,800	[5-7] 17,850,000	1,191,457,000	[7] 217,171,429	....
France	1901	1,173	....	16,963,000	[8] 13,812,000	....	....	....
Austria	1900	231	....	2,137,066	[9] 1,518,977	74,268,082	11,180,384	....
Hungary	1900	156	....	3,063,493	[9] 1,808,953	77,860,372	....	16,451,181
Switzerland[10]	1899	109	....	1,069,041	[9] 811,383	43,151,680	13,646,182	4,669,789
Holland[11]	1901	983	....	2,839,700	....	65,932,000	....	....

[1] First main track. [2] Additional trackage of double-tracked railways, exclusive of sidings and switches, 852.7 miles. [3] Includes expenditure for construction of lines not yet in operation. [4] On 1283 miles only. [5] Excluding taxes. [6] Based on 1479 miles. [7] On 1815 miles only. [8] The reports do not define expenses; they probably include taxes, and possibly interest on bonds. [9] Items included not indicated. [10] Not including mountain railways. [11] Includes light steam railways.

PLANS FOR REORGANIZATION OF THE AMERICAN STREET RAILWAY ASSOCIATION

A meeting of the committee on reorganization of the American Street Railway Association was held at the Holland House, New York, on April 1. President Ely announced at the meeting that, as authorized by the executive committee, he had requested Prof. Henry H. Norris, of Ithaca, to make a preliminary study of a plan for reorganization of the several street railway associations along the lines which had been recommended at the St. Louis convention and approved at the executive committee meeting held in New York, February 3 and 4.

The idea of this reorganization is to bind together more closely the several affiliated associations in order to promote efficiency. This preliminary study has now been completed by Prof. Norris, and his report, which was presented at the meeting on April 1, is partly reproduced herewith. The constitutions and proceedings of a number of steam and electric railway and lighting associations were digested in making this report, which in its complete form is voluminous. Certain recommendations were made and a proposed constitution suggested, and these are now under consideration by the members of the committee for suggestion and criticism.

The committee decided to make the main features of this report public, so as to secure a consensus of opinion of it, and will welcome any comments from members of the association throughout the country. Any criticisms will be laid before the committee at its full meeting to be held in Philadelphia during the month of June, upon the return of the chairman from Europe, and during this temporary absence of Chairman Ely, they should be sent to Prof. Norris, Cornell University, Ithaca, N. Y.

In analyzing the methods and practice of the various other railroad and other associations whose methods were studied, their work was divided into the following sections:

(a) Object.
(b) Means of attaining same.
(c) Members.
(d) Privileges of same.
(e) Officers.
(f) Meetings.
(g) Lines of work undertaken.
(h) Dues.

The study has resulted in the following suggestions as to important matters which should have consideration, and these are incorporated in the proposed constitution:

GENERAL FEATURES

THE CENTRAL ORGANIZATION

The central body would be known as the American Electric Railway Association, which would concern itself with the general management of electric railway properties by:

a. Considering those general questions which are connected with the relation of electric railways to the public.

b. Receiving reports from the branch or affiliated organizations, which would contain digests of progress made during each year in their particular fields, and which would recommend for the consideration of the central organization those features in which each special department requires the co-operation of the others in order to more perfectly accomplish its work.

c. Exercising such control over the branch affiliated organizations as would produce most efficient and economical progress as a whole, while interfering to the minimum extent with the autonomous government of the separate association.

In order to accomplish the desired compactness of the entire organization, the following "binding" features are recommended:

1. A "blanket" fee from company members paid to the central organization, from the treasury of which annual grants would be made to the several affiliated organizations.

The fee would be graduated upon a gross income basis so that the large roads bear a proportionate share of the expense.*

The grants would be made by the executive committee, and so proportioned as to meet the specific needs of each branch or affiliated organization, which would have the option of assessing its individual members in case its grants did not cover their needs for the year.

2. The printing and substantial binding of one or more volumes of proceedings, including the work of all branch or affiliated associations, at the expense of the central organization. The proceedings would be edited by a committee representing all of the organizations.

3. The granting of charters to and the approval of the constitutions of all branch or affiliated associations, all of which would be in harmony with those of the group of organizations.

4. The recommendation to the branch or affiliated associations of such topics for investigation and report as are within their particular fields. The committee on subjects, which makes these recommendations, contains representatives from all of the associations.

The executive committee of the central organization would consist of:

1. The president of the American Electric Railway Association.

2. Three vice-presidents of the American Electric Railway Association.

3. A member, preferably the president, of each of the affiliated associations.

The secretary of the American Electric Railway Association would devote his time to the work of the association and would have duties and salary as arranged by the executive committee.

Membership in the American Electric Railway Association should comprise the following:

Active members, consisting of railway companies or individuals operating electric cars. Each company or individual owner would be entitled to one vote regardless of the dues paid and would be encouraged to send as many delegates to the convention as possible.

Associate members, comprising persons who have been actively identified with electric railway affairs or whose work is of such a nature as to make their connection with the association desirable. These members would pay, say, $5 per annum, and they would have all the privileges of active membership in the association except those of voting and holding office. It is suggested that this class of membership be made attractive, as it spreads interest in the work of the association and at the same time does not weaken the central active membership. These members would receive copies of the proceedings, the cost of which would be more than covered by the fee mentioned.

BRANCH OR AFFILIATED ORGANIZATIONS

It is proposed that such branch or affiliated associations as are deemed necessary for the proper covering of the field of electric railway work be encouraged to organize, with the approval of the American Electric Railway Association.

These associations would prepare their own constitutions and would submit the same for the approval of the parent association. The field of activity of each would be designated by the executive committee of the parent association.

The names of the branch or affiliated associations would be selected in harmony with a general system for which the following are suggested:

American Electric Railway Association,
American Electric Railway Accountants' Association,
American Electric Railway Claim Agents Association,
American Electric Railway Engineering and Maintenance of Way Association, etc., or
American Association of Electric Railway Accountants,
American Association of Electric Railway Engineers,
American Association of Electric Railway Claim Agents, etc.

The branch or affiliated organizations would be free to work out their own plans except for the limitations already prescribed.

It is suggested that there be no company members in the branch or affiliated associations, and that the terms of individual membership be prescribed by each affiliated organization. They would make their rules as to the matter of dues if such are found necessary to supplement the grants made by the central organization.

In regard to the proceedings of the separate organizations, arrangement could easily be made by which these could be printed in separate pamphlets at a nominal price per copy, as it is evident that the technical features of each association's work would be most useful to its own members in this form. At the same time the feature of a complete set of proceedings, edited and published through the general secretary's office and distributed to members to the parent association, is a most valuable one.

CONVENTIONS

There are two possible plans for holding conventions, both of which have many points in their favor. One of these, as suggested by Richard McCulloch, consists in arranging all of the conventions at one time and place in such a way that one member can attend more than one convention. This plan gives concentration and efficiency of convention work, although it does disturb to some extent the routine work of the member companies. It also restricts the time allotted to each association to a small number of hours unless the conventions be extended over a week or more. It would be possible also to hold these conventions in rapid succession, one following the other immediately, or two or more at the same time where the lines of work were absolutely diverse.

The other general plan dictates a separate convention for each group of associations held at different times and places. These would result in the following advantages: Minimum disturbance of routine work of the member companies; relief of congestion of convention work; efficiency of convention work through concentration upon particular topics and absence of distraction; maintenance of continuity of work throughout the year instead of concentration within a few days at the general convention. The weakness of this plan consists in the lack of social features which have been prominent at previous conventions. However, it appears to be the conviction that these social features should now be allowed to take second place and that they should be turned over largely to the manufacturers' committee, which appears desirous of assuming the responsibility.

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* From figures published in "American Street Railway Investments" for the year 1904, the total gross receipts of 104 of the members of the American Street Railway Association during the preceding year amounted to a total of approximately $178,800,000, which figure covers the incomes of all of the large roads and many of the small ones. The range of gross receipts was from $15,436,574 to $30,301. The assessment would be a certain percentage of the receipts sufficient to cover the expenses of the association for the year.

In order that the manufaeturers' committee, which has taken sueh an interest in the material welfare of the members of the association at the time of holding conventions, shall have official recognition, it is suggested that a standing committee on conventions and exhibits, containing a representative of the manufacturers' committee, should control the question of exhibits to be held in connection with eonventions and to determine what should be the nature and extent of the entertainment features. The manufacturers' committee would be consulted as to these matters as at present, but in addition, the offieial representation on the standing committee would give the manufacturers' committee official recognition by the assoeiation.

CONSTITUTION AND BY-LAWS OF THE AMERICAN ELECTRIC RAILWAY ASSOCIATION

CONSTITUTION

NAME

I. The name of the Association shall be "The American Electric Railway Association," and its office shall be in the city of New York.

OBJECT

II. The objects of this association shall be as follows:

a. The discussion and recommendation of methods for the management and operation of electric railways.

b. The establishment and maintenance of a spirit of fraternity among the members by social intercourse, and the encouragement of friendly relations between the roads and the public.

c. Through the medium of the branch or affiliated organizations, the acquisition of experimental, statistical and scientific knowledge relating to the construction, equipment and operation of electric railways and the diffusion of this knowledge among the members with a view of increasing the accommodation of passengers, improving the service and reducing its cost.

MEMBERS

III. The membership of this Association shall consist of two classes as follows:

The ACTIVE MEMBERS of the Association shall consist of American Electric Railway Companies, or lessees, or individual owners of electric railways; and each member shall be entitled to one vote. Said vote may be cast by the properly accredited delegate.

The ASSOCIATE MEMBERS of the Association shall consist of individuals who have at some time been actively identified with electric railway interests and other persons who, in the opinion of the Executive Committee, have had experience of such a nature as to render desirable their connection with the Association. Associate members shall enjoy all the privileges of active membership, excepting those of voting and of holding office.

AMENDMENT

IV. This Constitution may be amended by a two-thirds vote of the members present at a regular meeting, after the proposed amendment shall have been submitted, in writing, at the preceding regular meeting and a copy sent to each of the active members.

BY-LAWS

APPLICANTS

I. Every applicant for membership shall signify the same, in writing, to the Secretary, enclosing the requisite fee, and shall sign the Constitution and By-Laws.

OFFICERS AND EXECUTIVE COMMITTEE

II. The Officers shall consist of a President, three Vice-Presidents and one member from each of the branch or affiliated associations, who shall constitute the Executive Committee, and a Secretary and a Treasurer. The representatives of the branch or affiliated associations shall be appointed by their respective associations.

The Executive Committee shall have the entire charge and management of the affairs of the Association. The officers and Executive Committee shall be elected by ballot, at each regular meeting of the Association, and shall hold office until their successors shall be elected. A two-thirds vote of the members present at any meeting of the Executive Committee shall be necessary to a decision. The duties of the Secretary and Treasurer may be performed by the same person. The Secretary and the Treasurer shall not be members of the Executive Committee and may or may not be identified with active members of the association.

DUTIES OF OFFICERS

III. The officers of the Association shall assume their duties immediately after the close of the meeting at which they are elected; they shall hold meetings at the call of the President, or, in his absence, at the call of the Vice-Presidents in their order, and make arrangements for carrying out the objects of the Association.

PRESIDENT

IV. The President, if present, or in his absence, one of the Vice-Presidents, in their order, if present, shall preside at all meetings of the Association and of the Executive Committee.

TREASURER

V. The duties of the Treasurer shall be to receive and safely keep all moneys of the Association; to keep correct accounts of the same, and pay all bills approved by the President; and he shall make an annual report to be submitted to the Association. He shall give a bond to the President in such sum, and with such sureties, as shall be approved by the Executive Committee.

SECRETARY

VI. The duties of the Secretary shall be to take minutes of all proceedings of the Association and of the Executive Committee and enter them in books proper for the purpose. He shall conduct the correspondence of the Association, read minutes and notices at all meetings, and also papers and communications, if the authors wish it.

The Secretary shall maintain an office in the city of New York at which shall be on file for the benefit of the members a collection of information in regard to all matters affecting the operation of electric railways.

The Secretary shall attend to the publication of the proceedings of this Association as well as those of the branch or affiliated organizations. He shall perform whatever duties may be required in the Constitution and By-Laws appertaining to organizations. He shall perform whatever duties may be required in the Constitution and By-Laws and appertaining to his department and such other duties as shall be assigned him by the Executive Committee. He shall be paid a salary to be fixed by the Executive Committee.

MEETINGS

VII. The regular meeting of the Association shall be held at such time between the fifteenth day of September and the fifteenth day of December, in each year, as the Executive Committee may decide to be best suited to the locality in which the meeting is to be held; the time to be decided upon and each member of the Association notified of the selection by the first day of March in the year in which the meeting is to be held. Special meetings may be held upon the order of the Executive Committee. Notice of every meeting shall be given by the Secretary, in a circular addressed to each member, at least thirty days before the time of the meeting. Fifteen members shall constitute a quorum of any meeting.

All sessions excepting those of an executive nature shall be open to all members, who shall have the privilege of discussing all reports and papers presented. Active members only shall attend executive sessions unless a special invitation is extended to others by the presiding officer.

ORDER OF BUSINESS (1)

VIII. At the regular meeting of the Association the order of business shall be:

1. The reading of the minutes of the last meeting.
2. The address of the President.
3. The report of the Executive Committee on the management of the Association during the previous year.
4. The report of the Treasurer.
5. Reports of Special Committees.
6. The election of Officers.
7. Reports of Standing Committee.
8. The reading of reports from the affiliated Associations.
9. The reading and discussion of papers of which notice has been given to the Secretary, at least thirty days prior to the meeting.
10. General business.

ORDER OF BUSINESS (2)

IX. At other general meetings of the Association, the other business shall be the same, except as to the 3d, 4th and 6th clauses.

NOTICES

X. The Secretary shall send notices to all members of the Association at least thirty days before each meeting, mentioning the papers to be read and any special business to be brought before the meeting.

EXECUTIVE COMMITTEE

XI. The Executive Committee shall meet one hour before each meeting of the Association; and on other occasions when the President shall deem it necessary, upon such reasonable notice as the Committee shall, by vote, determine, specifying the business to be attended to.

STANDING COMMITTEES

XII. In order to obtain continuity of the work and uniformity of general purpose the following Standing Committees shall be appointed each year by the Executive Committee:

A COMMITTEE ON SUBJECTS to select topics for the work of the American Electric Railway Association and the allied associations for each year in advance. This committee shall be composed of three members from the central organization and one from each of the branch or affiliated associations. The committee shall present its plans for the coming year at each annual meeting.

An EDITING COMMITTEE, the duty of which it shall be to prepare for publication all papers and reports. This committee shall consist of one member from the American Electric Railway Association and one from each of the branch or affiliated associations.

A COMMITTEE ON CONVENTIONS AND EXHIBITS, consisting of two members of the parent association and one from each of the branch or affiliated associations and one from the Manufacturers' Committee. This committee shall have charge of the plans for exhibit and entertainment features of conventions.

VOTING

XIII. All votes except as herein otherwise provided, shall be *viva voce;* and in case of a tie, the presiding officer may vote.

NON-MEMBERS

XIV. Any member, with the concurrence of the presiding officer, may admit a friend to each meeting of the Association; but such person shall not take any part in the discussion, unless permitted by the meeting.

READING OF PAPERS

XV. All papers read at the meetings of the Association must relate to matters connected with the objects of the Association, and must be approved by the Executive Committee before being read, unless notice of the same shall have been previously given to the Secretary, as hereinbefore provided.

BRANCH OR AFFILIATED ORGANIZATIONS

XVI. This Association shall do all in its power to promote the welfare of other associations organized to investigate technical matters connected with electric railway operation. To this end, it will in the following ways and in others which may be determined by the Executive Committee, assist in the work of such associations:

By granting of charters to and approving the constitution of such associations.

By admitting to the Executive Committee a member from each of such organizations.

By granting financial assistance for specific purposes.

By editing, printing and binding the reports of proceedings.

Through its Secretary and Committees it will assist in arranging for conventions, suggesting suitable subjects for investigation; it will file information for reference and in every way endeavor to stimulate interest in all of the affiliated organizations.

PAPERS, DRAWINGS AND MODELS

XVII. All papers, drawings and models submitted to the meeting of the Association shall remain the property of the owners, subject, however, to retention by the Executive Committee for examination and use, but at the owner's risk.

FEES

XVIII. Members shall pay an admission fee of twenty-five dollars, and annual dues of ten dollars, payable in advance. In addition there shall be an annual assessment made by the Executive Committee and based upon the gross annual receipts. The Executive Committee shall have no power to expend, for any purpose whatever, an amount exceeding that received, as hereinbefore provided.

ARREARS

XIX. No member whose annual payment shall be in arrears shall be entitled to vote.

WITHDRAWAL

XX. Any member may retire from membership by giving written notice to that effect to the Secretary, and the payment of all annual dues to that date, but shall remain a member, and liable to the payment of annual dues until such payments are made, except as hereinafter provided.

EXPULSION

XXI. A member may be expelled from the Association by ballot of two-thirds of the members voting at any regular meeting of the Association, upon the written recommendation of the Executive Committee.

RULES OF ORDER

XXII. All rules not provided for in these By-Laws shall be those found in Roberts' Rules of Order.

AMENDMENTS

XXIII. All propositions for adding to or altering any of these By-Laws shall be laid before the Executive Committee, which shall bring them before the next regular meeting of the Association, if it shall think fit; and it shall be the duty of the Committee to do so, on the request, in writing, of any five members of the Association.

COPIES OF CONSTITUTION AND BY-LAWS

XXIV. Each member of the Association shall be furnished by the Secretary with a copy of the Constitution and By-Laws of the Association, and also a list of the members.

MEETING OF THE COMMITTEE OF THE MANUFACTURERS' ASSOCIATION

A meeting of the executive committee of the American Street Railway Manufacturers' Association was held at Philadelphia on Friday, April 7, on account of the coming street railway convention in that city next September. The principal purpose of the meeting was to consider the facilities for an exhibit hall. Several halls, any one of which would be satisfactory, were inspected, but no actual decision was reached.

FINANCIAL AND POWER DEVELOPMENTS OF THE UNITED RAILROADS OF SAN FRANCISCO

Earnings of the United Railroads of San Francisco continue to increase. For the year just ended they were $6,652,628, or $404,411 more than in 1903. Indications for this year point to a still larger increase. For February, 1905, the gross earnings were $516,966, a gain of $34,563 over February, 1904. Changes in equipment being gradually effected will also tend to increase the earnings. Only a few days ago the electrified steam dummy line between Central Avenue and California Street was placed in operation.

The question of additional power facilities is being worked out slowly. Officials of the California Gas & Electric Corporation say that the gas engine reserve plant, which is being installed on the Bay Shore, in San Mateo County, will be completed by Jan. 1, 1906, when the contract to supply 16,000 hp to the United Railroads goes into effect. The greater part of this power will, of course, be transmitted for the corporation's water-power plants, as noted in an article on this subject in the STREET RAILWAY JOURNAL at the time the contract was closed.

The Toledo Railways & Light Company is planning to convert a number of its long double-truck summer cars into semi-convertible cars, following the plan adopted by the Cleveland Electric Railway, whose scheme for converting cars was described and illustrated in this paper some time ago. The cars will be equipped with air brakes, hot-water heaters, and Detroit platforms will be built. The company has decided upon the erection of a commodious office building adjoining its shops on Central Avenue. It will contain the offices of division superintendent, despatchers, a clubroom and lounging room for employees, baths, lockers and other conveniences for the men.

The Boston & Worcester Street Railway has aroused much interest among its employees by an offer of prizes for the best suggestions for improvement in handling traffic. A year ago it was announced that prizes of $25, $15 and $10 would be offered for the three best ideas suggested, and the winners have just been announced. They are Motorman M. G. Hutchings, of Wellesley; Conductor George J. Moran, of Marlboro, and Conductor Frank E. Wall, of Wellesley, the awards being made in the order named.

The management of the Detroit, Ysilanti, Ann Arbor & Jackson Railway has announced that the rate on the west end of the road from Ann Arbor to Jackson has been doubled. The rate was formerly 1 cent per mile throughout the line, but beginning April 1 the rate was made 2 cents.

THE QUESTION BOX

In this issue of the Question Box a number of general topics are discussed. Questions and answers on the handling of employees are continued and special attention is given to the subject of medical examinations. Under the heading of master mechanic's department are described and illustrated several forms of racks for holding freshly varnished window sashes and doors.

A.—GENERAL

A 13.—In the electric railway business, is an accident liability insurance company—mutual or otherwise—feasible? Why?

The writer does not think accident liability insurance feasible for the reason that it would mean too much delay in the adjustment of claims. It would be necessary also to employ agents to look after this part of the business, and thereby take the matter of claims entirely out of the hands of the company, but as so many other things in regard to operating enter into and make up claims, it would not be policy to place this department out of the control of the operating officials. I am under the impression that all attempts in this direction have proved a failure or very expensive to the companies. SUPERINTENDENT OF TRANSPORTATION.

No. Immunity from damages encourages laxity of discipline, hence there will be more accidents. Premiums would be prohibitive. L. M. LEVINSON. Mgr., Shreveport (La.) Tract. Co.

A 14.—Do you carry United States mail over your road? If so, please describe how you do it.

We carry mail on city cars going by sub-stations and postoffice. Mail is delivered to car and placed on platform in charge of conductor, who delivers it at destination. Mail is handled on interurban line on express trips by messenger in same manner as in practice on steam roads. R. P. STEVENS, Supt., Everett (Wash.) Ry. & Elec. Co.

Mail is picked up and delivered from and to the postoffices along our line by the motormen and conductors.
C. E. PALMER, Supt., Cincinnati, Dayton & Toledo Tract. Co.

We carry U. S. mail in regular mail pouches on front platforms of our regular passenger cars from central postoffice to the various suburban postoffices, but not to any sub-stations.
S. W. CANTRIL, Supt., Denver City Tramway Co.

A 15.—Relative to carrying United States mail and mail carriers, what are the salient points of the contract between your company and the Government?

It is of great advantage to have city mail delivered to cars, otherwise conductors would frequently forget it. Postoffice authorities will try hard to place this work on the railway company, but if the company insists the postal authorities will assume this responsibility. R. P. STEVENS, Supt., Everett (Wash.) Ry. & Elec. Co.

Our mail business is very light since we refused to carry mail to the sub-stations on account of the inadequate compensation which the government desired to allow.
S. W. CANTRIL, Supt., Denver City Tramway Co.

A 16.—What would be a proper basis on which to formulate contract with the Government for carrying United States mail on electric railways?

Street railway companies have looked upon the carrying of United States mails as a protection from the United States Government against interruption of service by lawless persons. This belief is a fallacy. The fact that the company carried mails has never worked out to the advantage of the company in times of disorder. If the United States Government wants the electric railway companies to transport mails, it should pay a fair and just remuneration for the service. ANONYMOUS.

The carrying of mail should be contracted for by the pouch or bag. C. E. PALMER, Supt., Cincinnati, Dayton & Toledo Tract. Co.

I think the government should pay at least 25 cents per car-mile for regular postal car, with guarantee of at least $15.00 per day income from each car so furnished by the railway company.
S. W. CANTRIL, Supt., Denver City Tramway Co.

A 17.—At one time the use of trail cars was quite general on electric railways throughout the country. Then came a period when the running of trailers was looked upon with more or less disfavor. There seems to be a decided tendency at the present time to go back to trailers. Please give your ideas and experience relative to trailers. Under what conditions do trail cars properly find a place in the operation of a modern electric railway? Do trail cars cause a greater number of accidents? If they do, what can be done to make them safer? What is the economy in running trailers?

Trailers are all right on straight lines. Economy in operating them is great. W. T. NARY, Supt., Hoosac Valley St. Ry. Co., North Adams, Mass.

On an interurban road the same as ours, I do not think it practical to run trailers. If business would warrant, it would be practical to run cars in trains, with each car equipped with motors. On city properties, where the volume of business would warrant, I think that it is preferable to run trailers rather than cars on ½-minute headway, if trailers were properly equipped. Trailers should be equipped with air, one motorman handling two cars. If the collection of fares could be done by one conductor, use only one conductor. H. C. PAGE, Gen. Mgr., Berkshire St. Ry. Co., Pittsfield, Mass.

Our standard interurban car is 62 ft. long. We consider trailers impractical for operation through cities, partly on account of the curves.
THEODORE STEBBINS, Gen. Mgr. for Receivers, The Appleyard Lines in Ohio, Columbus, Ohio.

We have not made a practice of running trail cars on our road, for the reason that we have such abrupt curves on our line, especially in the cities, that it is almost impossible to operate two 60-ft. cars, one as a trailer and the other as a regular, around the corners. There is a large advantage in running trail cars, and I would recommend it if cars are equipped with multiple control, which can be handled with one motorman and two conductors. However, the cars should be vestibuled. I would recommend the handling of a small trail car, but would say that the motor car should be long enough and heavy enough to ensure that it will hold the track and not derail. J. R. HARRIGAN, Gen. Mgr., Columbus, Buckeye Lake & Newark Tract. Co.

For city service the writer believes it better practice to increase the number of motor cars for short haul traffic rather than to run trailers. This also applies to all lines with heavy grades. Trailers increase accident on short haul lines, time is lost in making stops, and an additional conductor is required to handle each trailer in order to properly perform necessary duties and collect fares. Trailer cars on suburban and interurban lines can be run to advantage without increasing cost in conducting transportation. Trailers should be equipped with power brakes under control of the motorman. SUPT. OF TRANSPORTATION.

Trail cars are inexpensive as an investment, and as a rule will accommodate as many and often more passengers than a motor car. The wear and tear on track is trivial; the public like them in summer, and they are easily handled on a belt line, where no switching is necessary. They save two men, i. e., conductor and motorman, and where the headway cannot be shortened are often necessary. Accidents on account of trail cars are more numerous than with motor cars, but as a rule they are due to carelessness of passengers, and not to fault of company or employees. The greatest danger to trail car travel is derailments on special work, draw-bars pulling out, and cars becoming grounded at night. These are causes of damage suits. The excessive heating of motors pulling trailers causes loss. If trailers are included in the equipment, motors should be of 20 per cent greater capacity.
L. M. LEVINSON, Mgr., Shreveport (La.) Tract. Co.

We have fitted up a number of trailers which we employ during "rush hours" on various lines where 4-motor cars are used. We find them very satisfactory for the following reasons: It requires but one conductor to take charge of both cars; the current consumption of the train is but 20 per cent to 35 per cent more than that of a single car; the investment in trailers is very light compared with keeping extra motor cars at hand for "rush" hours and emergency travel. All trail cars in use here run in one direction only, and have a rail or strip on the outside. We have not experienced an unusual number of accidents on account of running trailers; in fact actual number of accidents has decreased.

S. W. CANTRIL, Supt.,
Denver City Tramway Co.

A 18.—Give suggestions based upon your experience for handling the extra traffic during the rush hours, and on special occasions, as ball games, fairs, etc.

In handling traffic at rush hours, extra cars should be put in to handle the crowd. On our system, which is a single track road, cars are run in sections with markers on each car, which indicate that there is a car following, the last car in the block carrying no signals. In the daytime we use green flags to indicate that there is another section following; at night, lanerns with green bull's-eyes.

H. C. PAGE, Gen. Mgr., Berkshire St. Ry. Co., Pittsfield, Mass.

Have the extra cars marked so they can be easily mentioned, and take no local passengers. Also run cars from some common point when passengers are liable to congregate direct to amusement resort.
H. A. TIEMANN, New York City.

Have plenty of cars, and have a surplus ready to start from the fair, ball game or park as soon as the home rush starts.

FRANCIS G. DANIELL, New York City.

As soon as you have a big crowd to handle, all moving to a common point of attraction, take off your big cars. It has been our experience that long cars are in the way when there are crowds to be handled at a park, circus, ball game or other attraction. Although one long car will carry 120 passengers to the grounds, it will take from two to three minutes to unload the car, and in the meantime there will be twelve small cars waiting to move into the terminal and unload. Provide enough single-truck cars, 24 ft. or 25 ft. in length, and you will handle your crowds in shorter time with less confusion than you can with any number of long cars. Moreover, it is impossible for one conductor to collect and register all the fares on a heavily loaded long car.

ANONYMOUS.

For rush hour traffic on city lines the writer thinks the best results are obtained by making a schedule with close headway, using the leeway (or lay over) to run up some of the cars on the line, and adding a sufficient number of extra cars to make up gaps caused by changing headway. After the rush is over, take off the extra cars and place the cars back on the regular schedule. This changes the runs of the line somewhat, but gives a more uniform schedule, unless the conditions require that double the number of regular cars or more be run during the rush, and in that case make a schedule of the extra cars to split the time of headway with the basis cars. On suburban and interurban lines that are run on 15-minute, 20-minute, 30-minute, 40-minute and one-hour headways, my experience is that it is better to run sufficient number of cars in trains to handle traffic, rather than extra cars between time-table trains, as this method saves time and expense. Patrons soon become familiar with time-table and look for regular trains, whereas it is difficult for the public to keep track of extras, as it is sometimes necessary to change them on short notice, and frequently the traffic does not justify running them daily. We only run extras on special occasions on interurban and suburban lines. When time-table trains cannot handle the traffic, the extras then take care of the overflow. For special occasions, as ball games, etc., we do not interfere with our regular schedules, but run all extra cars required from the park to central portion of the city, making up a schedule for these cars and having them properly signed for destination. We find that by this method the extra cars can be put on the lines and withdrawn without inconvenience to the public, and we are enabled to get double trips out of these cars, as against one trip if they were put into regular line schedule. This also avoids running the extra cars empty over portions of the route, and enables the extras to be banked for the homeward rush at the close of entertainments, which is a necessary procedure on some occasions, if the best service at minimum cost is to be given.

SUPT. OF TRANSPORTATION.

We are fortunate in having a central loop, from which cars going to summer resorts, baseball grounds, parks, etc., run. We also have side tracks and car storage room at central loop. We fill the side tracks with "extras," station a division superintendent or inspector at the place where the rush of travel is expected, and, having a despatching system with a telephone at each end of the line, the superintendent is kept advised through the despatcher as to the travel. Such extra, or loop cars are sent out as may be needed. The official placed at the resort notifies the superintendent as to the number of people at such resort, when they will come away, etc. The superintendent then sends the number of cars to "bank" on side track at this place, as may be required to bring the people away. We have sufficient trackage at such places to hold the required number of banking or side-tracked cars.

S. W. CANTRIL, Supt.,
Denver City Tramway Co.

A 19.—Has the running of so-called "sightseeing cars" been a popular and profitable experiment?

The so-called "Seeing Denver" enterprise was started in Denver a number of years ago by an enterprising real estate firm, and has been worked up into a very profitable business, and is very popular with the traveling public.

S. W. CANTRIL, Supt.,
Denver City Tramway Co.

A 20.—When "sightseeing cars" are operated over an electric railway system by outside parties, what is the usual compensation paid by the "sightseeing" company to the railway for the use of the tracks?

The "Seeing Denver" cars are operated by The American Sight-Seeing Car & Coach Company; they paying us a flat rate of so much per trip.

S. W. CANTRIL, Supt.,
Denver City Tramway Co.

A 21.—Is there any reason why an electric railway company should not operate its own "sightseeing cars"?

Depends largely upon local conditions and amount of sightseeing and tourist business obtainable, and whether or not the local company can obtain more of this business than an outside company which may have better facilities for keeping in touch with the railroads and the excursion business throughout the country.

S. W. CANTRIL, Supt.,
Denver City Tramway Co.

A 22.—Has the running of funeral cars been a popular and profitable experiment?

Yes. Always give special car at regular rates from church to cemetery.

W. T. NARY, Supt.,
Hoosac Valley St. Ry. Co., North Adams, Mass.

Yes. We operate funeral cars occasionally on interurban service, using baggage compartment for the casket.

THEODORE STEBBINS, Gen. Mgr., for Receivers,
The Appleyard Lines in Ohio, Columbus, Ohio.

We have no regular funeral cars, but we have an average of from two to three funeral parties every month over our road. A charge per car is made for each party.

J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Tract. Co.

Profitable and becoming more popular. We use a regular combination car for funeral parties, and this has proven satisfactory.

C. E. PALMER, Supt.,
Cincinnati, Dayton & Toledo Tract. Co.

Funeral cars have been very popular and profitable on our road. We work up this business and average one funeral car per day.

R. P. STEVENS, Supt.,
Everett (Wash.) Ry. & Elec. Co.

We have fitted up a trailer into a casket car. This car is used in connection with an ordinary motor car, or our special chartered car.

S. W. CANTRIL, Supt.,
Denver City Tramway Co.

B.—EMPLOYEES

B 9.—What physical examination do you require of applicants?

In addition to meeting the requirements as to age, weight and height, applicants are subjected to a physical test made by our examining surgeon. The test is conducted in a rigid manner, and is similar to that used by many insurance companies. Upon the recommendation of our examiner depends the applicant's position, and also his election to membership in our mutual aid association.
S. W. CANTRIL, Supt.,
Denver City Tramway Co.

Before the applicant is accepted he is sent to the company's surgeon, who makes a thorough examination and reports his findings on a blank (8 ins. x 13 ins.) sample of which is reproduced

SURGEON'S CERTIFICATE OF EXAMINATION.

1. Name .... (A) Age .... (B) Height .... (C) Weight ....
2. Have you now or ever had any of the following diseases?
(Answer Yes or No to each. Ditto marks not allowed.)

Disease of Brains	Bladder	Dropsy ....
Heart	Rheumatism	Fistulu ....
Lungs	Habitual Cough	Piles ....
Liver	Chronic Diarrhœa	Gravel ....
Stomach	Tumors of any kind	Syphilis ....
Bowels	Delirium Tremens	....
Kidneys	Spinal Disease	....

Has he any present source of disability in (A) Legs and Feet ....
(Applicant should be stripped for this examination. Note with care as to the presence of Varicose Veins, enlarged joints or anything tending to produce or prolong disability.)
(B) Arms and hands ....
(C) Urinary organs ....

4. Is applicant ruptured? .... (A) Has he ever suffered from Hernia? .... (B) What form? ....
(C) Present condition? ....
5. Has applicant a varicocele? ....
6. Has he ever had any severe illness or injury, or undergone any surgical operation? ....
(A) State when, where and give particulars ....
(B) If so was recovery complete? ....
7. Does he use intoxicating liquors? .... (A) Are there any indications that would lead you to believe that the applicant leads, or has led, anything other than a sober and temperate life? ....
8. Does he smoke Cigarettes? .... (A) Heart Sound .... (B) Pulse ....
9. Has he had Smallpox? .... (A) Has he been recently successfully vaccinated? ....
10. VISION.
(If possible, the test should be made with Snellen's cards, and expressed in twentieths.)

Distance Vision,	R. E.		Distance Vision,	L. E.	
Near "	R. E.		Near "	L. E.	
Color	R. E.		Color	L. E.	
Hearing	R. Ear		Hearing	L. Ear	

11. Does the applicant wear Glasses? ....
12. Should the applicant wear Glasses? ....

REMARKS

....

I hereby certify that I have examined ...., the applicant named in the foregoing application, and find that he is physically and mentally competent to discharge the duties of ....

Dated .... 190..

....
Examining Surgeon.

MEDICAL EXAMINATION BLANK USED BY UTICA & MOHAWK VALLEY RAILWAY

herewith. On the reverse side of the form are diagrams of the human skeleton and form, by means of which the surgeon indicates any deformities.
C. LOOMIS ALLEN, Gen. Mgr.,
Utica & Mohawk Valley Ry. Co.

An examination by the company's physician for defects of color, perception, vision, hearing and physical defects that would disqualify for the position of conductor or motorman.
E. J. RYON, Supt., Schenectady Ry. Co.

The company's surgeon thoroughly examines every accepted applicant for eyesight, hearing and general physical condition.
SOUTHERN SUPERINTENDENT.

None if the applicant is apparently sound.
J. R. HARRIGAN, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

Thorough physical examinations. Applicants pay $1 to surgeon for this examination.
JNO. J. AKIN, Supt., Los Angeles Ry. Co.

Their eyesight and hearing must be good, and their general condition healthy.
C. E. PALMER, Supt.,
Cincinnati, Dayton & Toledo Tract. Co.

None. We accept their statement and rely on our observations.
J. CHAS. ROSS, Gen. Mgr.,
Steubenville (Ohio) Tract. & Lgt. Co.

Weight and height taken and examination by a company surgeon for heart and lung action and physical deformities.
J. W. BROWN, Supt. Trans.,
Pittsburg, McKeesport & Connellsville Ry. Co.

A thorough examination by a medical expert, and satisfactory

SURGEON'S CERTIFICATE OF EXAMINATION.

Of ....
Occupation .... Age ....

VISION		COLOR SENSE	HEARING	
Right eye	20	Green	Right ear	20
Left eye	20	Red	Left ear	20
Combined	20	Purple		
Letters recorded when rejected		Numbers recorded when rejected.	Whisper or acoumeter.	

What is rate of Pulse .... of Respiration ....

	NAME	DATE
What diseases has he suffered from?	....	....

Has he ever suffered from hernia? .... What form? .... Its present condition? .... Has he ever suffered from injury? .... If so what and when? .... Is he the subject of any deformity, from injury or otherwise? .... If so, note here and locate on skeleton blank herewith ....

Has he any present source of disability in .... { Heart .... Lungs .... Kidneys .... Joints .... Veins .... Feet and Legs .... Hands and Arms .... Spine .... Urinary Organs ....
(Applicants should be stripped for this examination Note with care varicose veins, enlarged joints and anything tending to produce or prolong disability.)

Does he use intoxicating liquors? .... Is his appearance that of a temperate man? .... Does he smoke cigarettes? .... Has he had small pox .... or been recently vaccinated? ....
His height is ...... feet ...... inches; weight ...... lbs.; color of eyes ....; of hair ....
He is physically a { First-class / Average / Defective } subject for position as ....

(Signature) ....
Surgeon.

Examined ....
Date .... 19....
Signature of applicant to be taken at Surgeon's office.

(Sign here) ....
Applicant

REMARKS:
(Anything lacking in spaces above should be added here.)

MEDICAL EXAMINATION BLANK USED BY SYRACUSE RAPID TRANSIT RAILROAD

answers to the questions on the surgeon's certificate (reproduced herewith). J. E. DUFFY, Supt., Syracuse Rapid Transit Ry. Co.

B 10.—What is the method of testing for eye-sight and hearing?

The eyes are tested by lights of various sizes and colors, and also by small and large letters. The hearing is tested with a tuning-fork.
C. LOOMIS ALLEN, Gen. Mgr.,
Utica & Mohawk Valley Ry. Co.

The method used by our physician is similar to that ordinarily used for testing eyesight and hearing.
E. J. RYON, Supt.,
Schenectady Ry. Co.

Rigid examination by our oculist and aurist, and a certificate issued by him which is filed in the superintendent's office
J. R. HARRIGAN, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

Thorough examination by specialist.
JNO. J. AKIN, Supt.,
Los Angeles Ry. Co.

Eyesight is tested by the color test. Hearing is tested with a watch.
C. E. PALMER, Supt.,
Cincinnati, Dayton & Toledo Tract. Co.

Applicant is sent to company oculist who tests vision of each eye by card method with distances based on the metric system. Applicant must show 6-6 in each eye. Color vision in each eye is tested by combination of red and green, varying in shades by the use of an electric screen. Hearing is tested by laboratory standard tuning-fork. The eye and ear records of each applicant are entered on a card, 4 ins. x 9 ins. in size, which card is uniform with cards covering accidents, complaints, fare registration and totalizer cards. The cards are filed alphabetically under the men's names.
J. W. BROWN, Supt. Trans.,
Pittsburg, McKeesport & Connellsville Ry. Co.

B 11.—What methods do you employ for training new motormen and conductors as to their duties?

After having passed the physical examination and filled out his application blank the applicant is given a card, one side of which reads: "To the Despatcher at ———. Please put the bearer ——— on as ———, beginning with the above date," which is signed by the superintendent of transportation. This he takes to the despatcher. The despatcher then puts him on with some reliable man for two or three days on each of the lines, first during the day, and then the same time on these lines at night. This occupies probably fifteen days. The last man with whom he runs signs his name on the opposite side of the card, thereby certifying that the beginner is capable of taking charge of a car. The learner is then turned over to the master mechanic for two or three days, who instructs him in regard to the machinery of the car. The card is then signed by the master mechanic and the despatcher and is taken by the beginner to the superintendent, from whom he receives his rule book, badge and final instructions.

C. LOOMIS ALLEN, Gen. Mgr., Utica & Mohawk Valley Ry. Co.

Motormen entering the employ of this company are first sent out with experienced motormen to learn how to handle a car. After this has been accomplished they are required to report to the master mechanic, who gives them a course of training in the shops, requiring them to do whatever work they might be called upon to do with a car on the road. After from three days to a week in the shop they are given an examination by the master mechanic, and if the examination is satisfactory are sent back to the transportation department, where they are examined on the rules. They are then sent to the claim department, where they are thoroughly instructed in their duties pertaining to an accident, and if found satisfactory all around, are placed on the extra board. Conductors are sent out on the lines to be broken in, and when they have learned all of the lines and to properly call streets, and are thoroughly posted on the duties of collecting and registering fares, making reports, etc., are given an examination by the transportation department and by the claim department, and if found satisfactory are placed on the extra board.

E. J. RYON, Supt., Schenectady Ry. Co.

Applicant for the position of conductor is placed on the car under the instruction of an experienced employee and serves for seven days, or more if necessary, until he becomes familiar with the bell signals, collection of fares, issuing and accepting of transfers, names of street and public places and transfer points. The new man then serves one day on each of the other lines of the company, making in all about fourteen days. He is then sent to the starter for examination as to his knowledge of the rules and transfer points, etc. The same routine is gone through with applicants for the position of motormen, and, after they have finished their time on the road, they are sent into the car houses for instruction and examination as to their knowledge of the electrical equipment. This examination is made by the master mechanic.

J. E. DUFFY, Supt., Syracuse Rapid Transit Ry. Co.

A term of two weeks in the car shops, and training under at least two motormen, chosen for their experience and good judgment, until pronounced competent to handle a car. Afterwards an examination on the rules conducted by the superintendent.

J. R. HARRIGAN, Gen. Mgr., C. B. L. & N. and C. N. & Z., Columbus, Ohio.

After being interviewed by the superintendent they are supplied with badge, rule books and are given special instructions by the assistant superintendent. They are then turned over to the student instructor.

JNO. J. AKIN, Supt., Los Angeles Ry. Co.

They are put on with a regular man and instructed by him.

C. E. PALMER, Supt. Cincinnati, Dayton & Toledo Tract. Co.

Motormen and conductors are trained on cars in service by regular motormen and conductors, and in addition are drilled by an instructor, and they are finally examined and lectured by superintendents.

SOUTHERN SUPERINTENDENT.

Put them on for instruction with an experienced man.

J. CHAS. ROSS, Gen. Mgr., Steubenville (Ohio) Tract. & Lgt. Co.

Before a man is permitted to go on the front end of a car for instruction, he is sent to our repair shops to spend a few days in the motor and truck department. In this department we have a "student's car," which consists of a platform on a truck equipped with two motors and raised from the rail, so that the wheels will revolve when current is turned on. The car wiring, resistance, lightning arrester, etc., are all shown in a convenient manner for instruction, and the controller and brake-rigging are also exposed for inspection. The studies of the new men are carried on under the tutelage of a competent man. After the man has become familiar with the working of the motors, controller, brakes, etc., he is sent to one of the car house foremen for special instruction, and afterwards spends a night in the car house at which he is expected to report. Here he learns the process of running cars in and out of the house, and receives some further enlightenment in taking care of the equipment. Then he is ready to "break in" as motorman. During the week or ten days that he spends on the car, he is carefully instructed on the running time, and is required to become familiar with all lines belonging to the division on which he runs. We find that the best results are obtained by breaking motormen in on the late cars. It seems to give them a familiarity with the lines which they do not acquire on the day cars. After being "turned in" by the motorman instructor, the student makes a "trial trip," and if found satisfactory, is recommended for examination. He then writes answers on a list of printed questions to test his knowledge of the company's rules. If he passes in this he receives his badges and is ready for duty. After beginning work, new motormen are required to put in their spare time learning the lines and running time of other divisions so that they may be familiar with such lines in case it becomes necessary to send them out on extra cars at busy times. Conductors are not required to enter the shops and car houses for instruction, but are immediately placed on a car for the usual practice, afterward making "trial trip" and passing written examination.

S. W. CANTRIL, Supt., Denver City Tramway Co.

E.—THE MASTER MECHANIC'S DEPARTMENT

E 82a.—What is the best remedy for preventing sleet and ice from forming on car windows, particularly on the vestibule windows?

Glycerine is about the best preventative we have found, but it is not entirely satisfactory.

WM. F. DEMENT, Washington (D. C.) Ry. & Elec. Co.

E 83.—Do you know of an improved form of table or rest for expediting the work of varnishing window sash? If so, please give description, with photograph or drawings. (Rough sketch will do.)

A revolving table with a top small enough to bear only on the glass. A high revolving office stool makes a good table for this purpose.

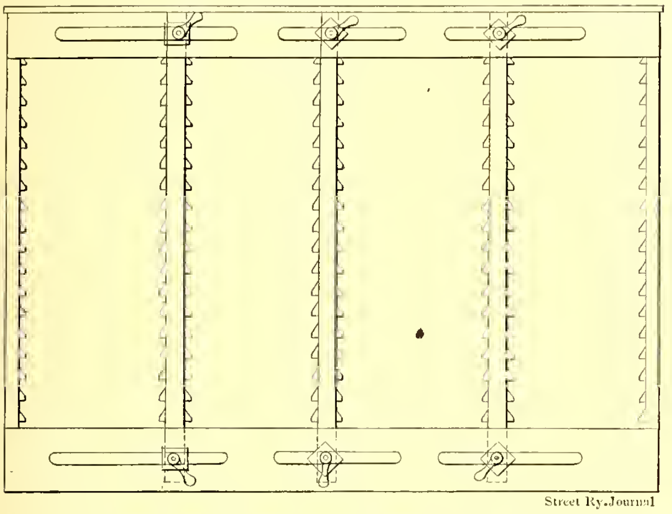
FRANCIS G. DANIELL, New York City.

In the foreground of the photograph reproduced under question E 84 in this issue, showing the sash rack used in the paint room of the Utica & Mohawk Valley Railway Company, will be seen the revolving stands used at these shops for varnishing sash. The top of the stand contains four small blocks tipped with rubber upon which the glass in the sash rests, thus there is no slipping, and the varnishing of the sash is very easily accomplished.

W. J. HARVIE, Elec. Engr., Utica & Mohawk Valley Ry. Co.

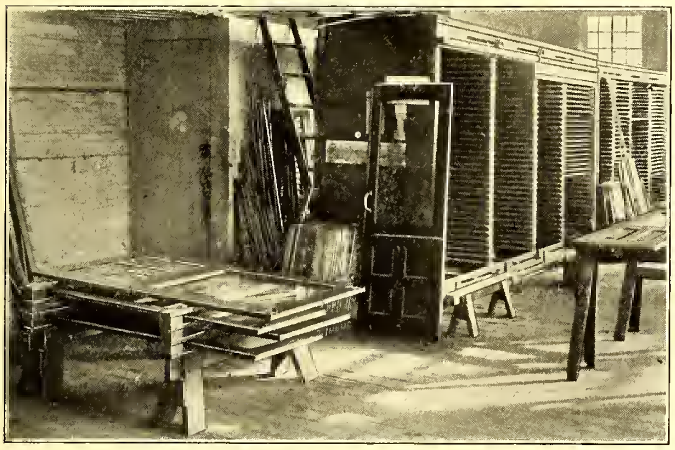
E 84.—Please give description with photograph or sketch of good form of rack for holding freshly varnished window sashes and doors.

The rack used at the shops of the Detroit United Railway for holding freshly varnished sash consists of a strong wooden frame closed at the ends and top, but with front and back open. The partitions are movable, being clamped as shown in sketch, and have cleats fastened to them which are beveled on top, thus allowing the sash to rest only on the edges. Curtains are placed on front and back to keep out the dust after the rack has been newly filled. For stacking freshly varnished doors two low horses are used as a foundation. On each of these, two wooden wedges are laid far enough apart to allow only the edge of the door to rest on them. Two bridges consisting of blocks of wood are then placed over the door, one on each horse outside of the wedge. These act as a new surface for more wedges and bridges, and by continuing the process the doors may be piled as high as desired, and a cover placed over them. After the doors are dry they are placed standing on the floor with the back edge resting against an arm projecting from the wall.



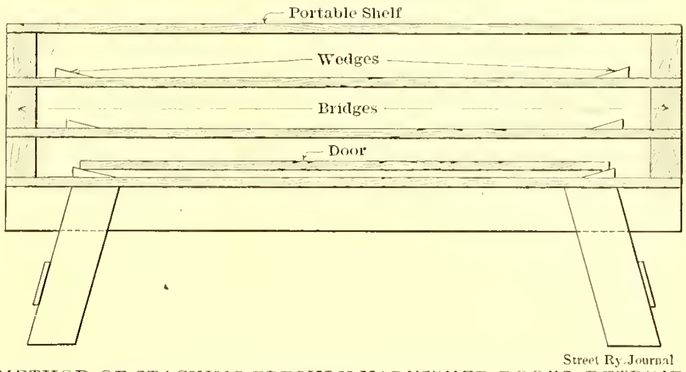
RACK FOR HOLDING FRESHLY VARNISHED SASH, DETROIT SHOPS

SYLVESTER POTTER, M. M., Detroit United Ry.



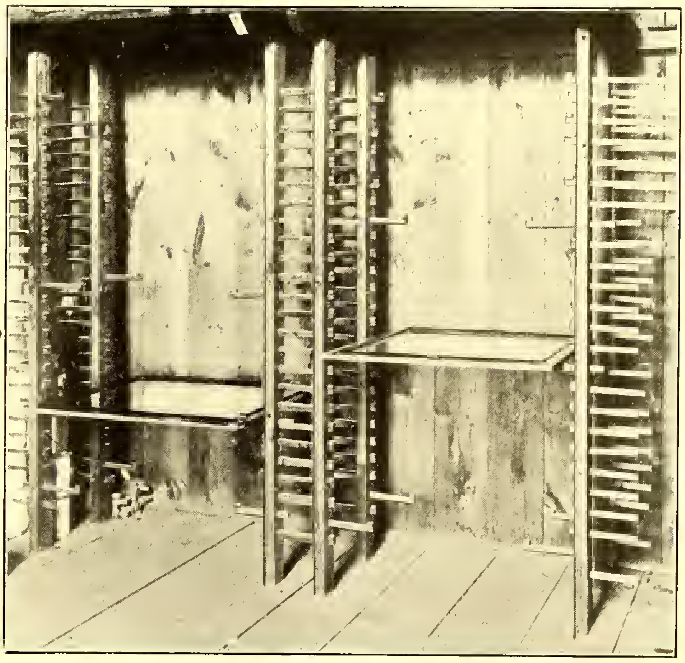
METHOD OF STACKING FRESHLY VARNISHED SASH AND DOORS, DETROIT SHOPS

The Utica & Mohawk Valley Railway Company has in use in its paint shop at Utica Park the rack for drying car window sash shown in the illustration. The sash are supported on slides placed at an angle, so that only the edge of the varnished surface can come in contact with the rack. There are two sections of the rack, each 14 ft. 6 ins. long, 6 ft. 6 ins. high and 4 ft. deep, divided into five parts with 14 slides in each part, making accommodation in all for 140 sash. The partitions are spaced to take the sash in use by the company, but the slides project 4 ins. from the vertical supports, and thus allow a range of 8 ins. in the width of sash that can be placed in any division. The slides are of ¾-in. planed maple 5⅛ ins. wide, 4 ft. long and placed at an angle of 3 to 4. The top is ceiled with matched stuff to prevent dust from settling on the newly varnished work, and across the front at the top is a 3½-in. blackboard strip for the numbers of the cars to which the sash belong.



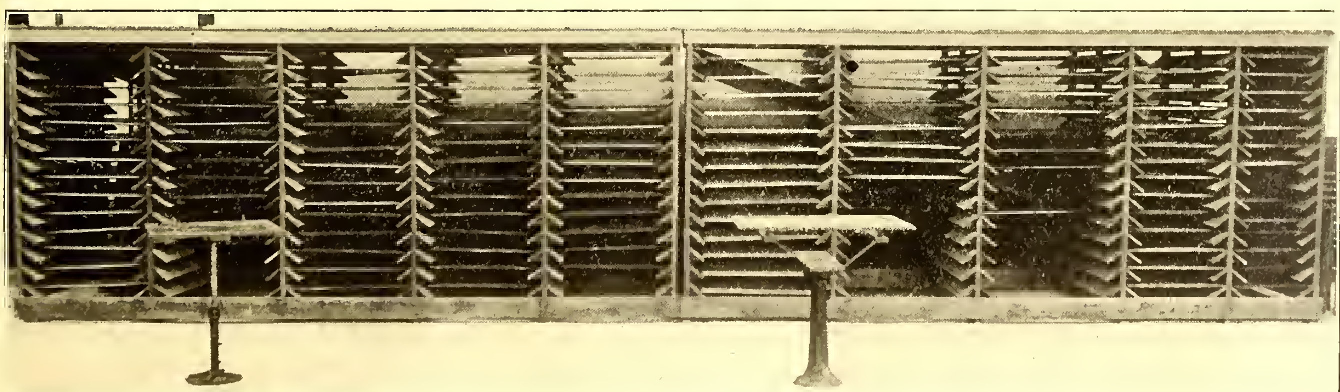
METHOD OF STACKING FRESHLY VARNISHED DOORS, DETROIT SHOPS

W. J. HARVIE, Elec. Engr.,
Utica & Mohawk Valley Ry. Co.



NOVEL FORM OF SASH RACK

After trying various forms of racks for holding freshly varnished window sash we hit upon the scheme illustrated in the photograph. As shown, the sash rest upon adjustable wooden pegs having small caps at one end, upon which the glass rests, so there is no chance of marring the varnished surfaces. The racks will take any size sash and there is no danger of a rack full of sashes dropping in a heap as sometimes occurs with racks in which the upright standards are made adjustable. MASTER MECHANIC.



SASH RACK AND VARNISHING STANDS, UTICA & MOHAWK SHOP

THE RAPID TRANSIT PROBLEM IN BOSTON

Recent legislative projects in regard to rapid transit in Boston and its vicinity are interesting in view of their relation to the symmetrical development of the city's transportation facilities as a whole. At a hearing held before the committee on metropolitan affairs at the State House three bills were discussed providing for extensions of the present system, or new routes, the sections of the city under consideration being South Boston, the Back Bay and the western suburbs of Allston, Watertown and the Newtons. The propositions in hand included additional facilities other than the surface lines afford between South Boston and the city proper, an extension of the present Public Garden branch of the existing subway to Copley Square, and as a third scheme the construction of a tunnel and subway from Scollay Square under Beacon Hill and the proposed Charles River embankment to Massachusetts Avenue.

The South Boston situation appears scarcely ripe for the extension of the elevated structure in that direction, according to the facts brought out at the hearing. High-speed transportation is naturally desired by all sections of the city, but there is every reason to believe that the short distance of South Boston from the business district, and its comparatively limited population as a suburb, do not at present justify the costly provision of elevated or subway routes, particularly as the situation can be adequately treated by due provision of surface cars. The other two bills were designed largely to relieve the rush-hour congestion on Boylston Street, which is the main artery of traffic in the Back Bay. About 160 cars an hour are now passing over this street in rush hours, between the subway and Copley Square, and although the traffic is handled with all possible skill and energy the conditions are greatly against anything like rapid transit. The situation is complicated by the presence of innumerable vehicles and pedestrians, which tend to hold back the cars long after passengers have alighted or come aboard.

President Bancroft, of the Boston Elevated Railway Company, pointed out that, although the number of cars on Boylston Street is very great, the extension of the subway to Copley Square would not diminish the number of cars seeking that route. As for the Beacon Hill scheme, he stated that it was in his mind more tentative than anything else, and that with but one or two stations it was difficult to see how the residents of Beacon Hill would be more than incidentally accommodated. The principal advantages would be reaped by the communities lying to the west. At the present time over 50 per cent of the cars running on Boylston Street enter the city via the Massachusetts Avenue or "Harvard" Bridge across the Charles River. These cars pass through Cambridge in coming from Somerville, Cambridge, Arlington, Belmont, Watertown, and indirectly from Brighton and Newton. A large portion of these cars go out of their way in traversing this route, which is an indirect means of getting down town in comparison with the projected elevated road to Cambridge. General Bancroft stated that with a schedule time of eight minutes over this new route between Harvard and Scollay Square, in comparison with the present running time of twenty-six minutes or thereabouts under favorable conditions, the relief experienced by Boylston Street ought to be enormous, in view of the large number of people whose objective point is Park Street or Scollay Square.

Furthermore, the operation of six or seven-car trains in the new Washington Street Tunnel and the consequent removal of the elevated trains from the existing subway will enable the company to put certain surface cars back. Thus, some of the crosstown cars originating in Roxbury or the extreme south end and now passing through Massachusetts Avenue to Huntington Avenue and Boylston Street can be then diverted down Columbus Avenue through Berkeley Street to lower Tremont Street, and thence through the old subway. Boylston Street is not a natural route for many of the cars now operating upon it.

The population of the Back Bay, Brookline, Brighton and Newton is not relatively large, although the area of territory included is large. The rapid transit scheme of the community provides two trunk lines or axes at right angles, roughly speaking. One of these is the north and south line from Forest Hills to Sullivan Square, via the elevated structure and the Washington Street Tunnel, and the other is the east and west line between East Boston and Harvard Square, Cambridge. It is of doubtful expediency at this time, in view of the great developments now under way, to add another spoke reaching from the Hub, as suggested in the proposed bill, toward the section at the west of the city.

INVESTIGATING TROUBLES IN CAMDEN

A system of investigating troubles and delays to the schedule has been in use for some time on the South Jersey Division of the Public Service Corporation of New Jersey, and has been found to give very satisfactory results. The system was instituted several months ago by W. E. Harrington, who was then general superintendent of the South Jersey Division. Its object was to determine the cause and place the blame, if any, of all delays and accidents, so that a remedy could be applied by which similar troubles would be avoided in the future. To do this properly, Mr. Harrington decided that all troubles of this kind should be considered by a committee of the foremen of the road so that each department should be represented. In this way there can be no opportunity of any one department laying the blame unjustly on another, as might occur if the report was submitted by the head of one department only. For instance, delays caused by trolley wheels leaving the wire might be attributed by the master mechanic to defective overhead construction, but by the lineman to the trolley wheels; bent axles can be caused both by poor track or an imperfect overhauling, and so through the entire category of street railway troubles.

In consequence of this condition, an investigation committee was appointed consisting of the superintendent of transportation, the chief engineer, the master mechanic, the line foreman and the superintendent of track. This committee was instructed to meet every morning and go over the record of all car delays for the preceding day. The record of car delays considered by the committee is made up from the despatchers' reports. For instance, if a car is held at a railroad crossing, or if there is any trouble with the motors, the motorman reports the cause of the delay to the despatcher at the end of the line, whose report is handed in to the master mechanic's clerk, and is then typewritten and manifolded for the heads of the departments for consideration at the meeting. Another report which is also before the committee at these meetings is that sent in of the material used for quick repairs at the terminus of the line by the general utility man kept at this point by the master mechanic. The form in which these reports are submitted is as follows, which is an actual record of the delays on Jan. 17:

REPORT OF DELAYS

A. Car 174, block 101, 10:34 a. m. Late 10 minutes; received car late at B. L. J. W. Garwood.

B. Cars on Market Street lines blocked 13 minutes by the bridge being off. Time, 11:34 a. m.

C. Car 160, block 126, 6:54 p. m. Late 10 minutes; due to car 159, block 127, being off the track at Cooper Avenue, Woodlynne. F. Urshin.

D. Cars of Broadway line blocked 20 minutes by a furniture wagon being broken down on inbound track. Disp. Geary sent to scene of trouble, 2:58 p. m.

E. Car 130, block 132, 8:48 a. m. Bad brakes. W. H. Deets.

F. Car 126, block 132, 9:08 p. m. Broken seat; delayed 7 minutes trying to fix same; car 129 in place. C. S. Daily.

G. Car 133, block 135, 6:40 a. m. Motor trouble. D. Marshall.

H. Car 136, block 136, 8:08 a. m. Delayed 5 minutes at Ferry with motor trouble. J. Kabinsky.
I. Car 108, block 153, 4:23 p. m. Very dirty car, also late 15 minutes, due to crippled cars lying in front of her. C. Wheatland, D. McClure.
J. Car 139, block 154, 12:43 p. m. Repairing motor leads; delayed 5 minutes. W. T. Abbott.
K. Car 74, block 155, 9:00 a. m. Grounded. W. W. Quarrington.
L. Car 74, block 155, 7:50 p. m. Stove loose; came to barn from Third and Federal. Had no passengers. Thornton.
M. Car 123, block 162, 9:38 a. m. Bad brakes, and bolt out of motor support. F. Cassidy.
N. Car 145, block 162, 1:44 p. m. Air motor trouble. Car 147 in place. J. Ward.
O. Car 133, block 163, 4:32 p. m. Late 10 minutes; left barn late, due to crippled cars lying in front. C. Diehl.
P. Car 155, block 212, 7:25 p. m. Trolley base trouble. Lost one and one-half trips. R. B. Crawford.
Q. Line down Kaighn's Avenue Ferry. Sent wagon.

PERCENTAGE OF DELAYS AS TO LINES

Market Street line	12.5
Broadway line	12.5
Haddonfield line	25.0
South Second and Third Street line	25.0
North Cramer Hill line	18.7
Pensauken line	06.3
Total	100

As described, these troubles were taken up seriatim by the investigation committee, after each foreman had been given a copy so that he could confer about them with his subordinates. The report of the entire committee on each trouble is typewritten in concise language. It is then manifolded and a copy kept by each department and one is sent to the general manager. The report on the troubles given above appeared as in the form below:

REPORT OF INVESTIGATING COMMITTEE

January 17, 1905.

Committee present: Hewett, Johnson, Crawford, Cox, Wilson.
Investigated January 21, 1905.
A. Car 174. Unavoidable.
B. Car 174. Unavoidable.
C. Car 160. Bad track, Ferry Avenue and Parker Avenue, Woodlynne.
D. Car 160. Wagon broken down.
E. Car 130. Night man censured.
F. Car 126. Seats defective, contract now placed with Heywood Bros. Company. Gradually replacing this type of seat.
G. Car 133. Motor axle bearings. No stock. Mr. Johnson to take up with Mr. J. R. Wilson; stock ordered some time in December, 1904.
H. Car 136. Mr. Crawford has to report. Mr. Hewett to see J. Kabinsky.
I. Car 108. Further investigation at next meeting.
J. Car 139. Referred to P. N. Wilson for prices etc., for different type of connector.
K. Car 74. Roasted fields. Shop to test new insulating varnish as against that which is now being used and which is not waterproof.
L. Car 74. Came to barn, finished run.
M. Car 123. Bolt in motor support broken. Brakes taken up.
N. Car 145. Open circuit in air armature. Break is caused by wire making a sharp bend over mica (V) ring back of commutator. A remedy is being tried.
O. Car 133. Future investigation. (See I.)
P. Car 155. Cannot locate.
Q. Cox reports no interference to car movement.

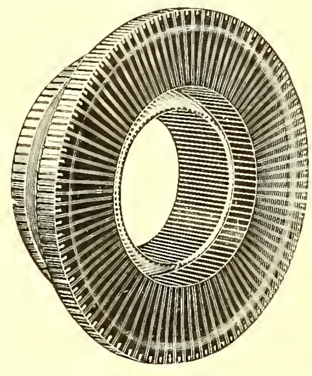
(Signed) F. A. Hewett,
Chairman Inquiry Committee.

As a rule, the delays occurring on one day are investigated the following morning, but in case of a large storm or some other occurrence which prevents the committee from meeting there is sometimes a delay of two or three days.

The result of this practice has been very satisfactory, even in the case of delays at steam railroad crossings. Previously nothing especial was done in regard to them, but all occurrences of this kind are now recorded, and if they happen too frequently the matter is taken up with the steam railroad authorities.

HARD-DRAWN COPPER COMMUTATOR SEGMENTS

The efficient operation of direct-current machinery depends so largely on the quality of the commutator that, should the original segments be replaced by inferior ones, more or less trouble is bound to occur. This is often the case, because the spirit of false economy tempts many purchasing agents to order inferior renewal parts. While the relative merits of drop-forged, cast or hard-drawn copper for commutator segments have never been definitely decided, still it is interesting to note that one of the leading commutator builders, the H. P. Cameron Electric Manufacturing Company, of Ansonia, Conn., is a firm adherent of the hard-drawn copper bar, although it has had extensive experience with and manufactures the other types also. This company states that it has found the hard-drawn copper bar to be denser, uniform throughout, of unequaled conductivity, and at least as hard as drop-forged or cast bars.



COMPLETE COMMUTATOR

A valuable auxiliary which this company makes in connection with its commutator segments, when so ordered, is an inserted lug completely prepared for the armature lead connections. This lug needs no milling, which in itself saves a great deal of labor. The lug is riveted in a narrow slot sawed in the end of the segment where the connection is to be made; two rivets with countersunk heads are used, which are machined off flush with the side of the segment, thus leaving no obstruction. To strengthen this connection mechanically and insure a perfect electrical bond, the entire end of the segment, lug and all, is thoroughly sweated in solder, which also results in tinning the lug for facilitating the soldering of the armature leads in it. The lug is built up of two copper straps, separated at the top sufficiently to take on the armature lead, as shown.

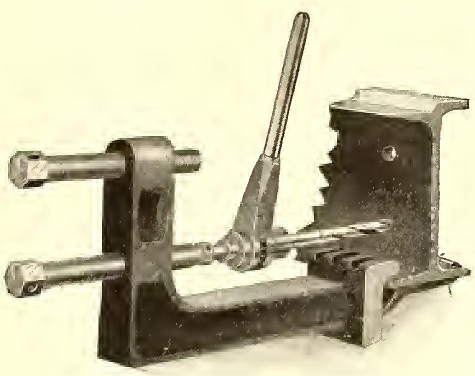
COMMUTATOR SEGMENT, WITH LUG FOR ARMATURE LEADS

The other illustration shows a complete commutator as built by this company.

A motorman and a conductor in the employ of the Denver City Tramway Company took into camp two highwaymen who attempted to hold up a car at the east end of the line. The conductor was reporting to the despatcher when he was suddenly requested to throw up his hands. Instead of complying, he attacked his assailant. The motorman came to his aid at once, armed with the controller. One of the robbers was scared off at once, and the other, at the hands of the tramway men, received such rough handling that an ambulance had to be called to care for him. Both the employees are old and trusted men. They have been substantially rewarded by the company for their daring.

SECURITY DRILL CLAMP

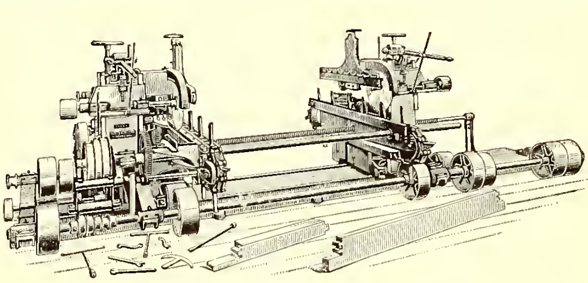
A useful tool for track work is the security drill clamp marketed by the F. Bissell Company, of Toledo, Ohio. This clamp is made to attach to the base of any rail and to remain there firmly while in use. The end hooks over one side of the flange and the sliding claw fits over the other. There is no bend nor spring to it, and when the drill is in use the alignment is preserved.


THE SECURITY DRILL CLAMP

The vertical arm holds two adjusting screws, each 1 in. x 8 ins., which follow the drill forward. They are of ample size, can stand heavy use and are cupped to receive a ratchet head. Two screws are provided to save time for the workman, and their centers, respectively, are set 2 ins. and 6 ins. above the horizontal arm. In use, this arm comes tight against the rail base, so these measurements apply to the rail itself. The complete tool is very light, weighing only 34 lbs. when boxed.

AUTOMATIC DOUBLE CAR TENONER

In bringing out the new tenoner No. 8, shown herewith, it has been the aim of the builders, the J. A. Fay & Egan Company, of Cincinnati, Ohio, to make it as labor-saving as possible, and as it is entirely automatic, all responsibility is taken off the operator as to marking his stock. The machine cuts to exact lengths, and each piece comes from it accurately worked and with great rapidity. Limited space permits only a brief exposition of its many features and mechanical improvements for performing the work desired to advantage, but special attention is called to the following points:


AUTOMATIC DOUBLE CAR TENONER

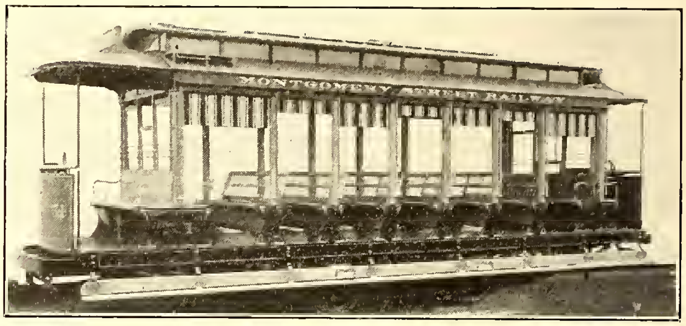
It will cut off and tenon material from 10 ins. to 9 ft. long between shoulders, and will cut off and tenon both ends of timbers to 24 ins. wide and 8 ins. thick. By cutting off the lengths on some other machine, dispensing with the saws on this, timbers 12 ins. thick can be tenoned to advantage. Saws 22 ins. in diameter can be used, and, operating in advance of the cutter heads, the bur raised by the saws is perfectly removed by the cutters, thus saving much valuable time. A special head is provided for making double tenons to 4 ins. deep. There are eight tenoning heads, two on each spindle, and each carrying two knives, cutting tenons 6 ins. long, so by using two heads on each spindle a tenon 12 ins. long can be cut.

The machine is massive and strongly built to stand hard work. The adjustments can be made quickly and accurately.

SUMMER CARS FOR THE MONTGOMERY, (ALA.) STREET RAILWAY COMPANY

The Montgomery Street Railway Company has recently added to its equipment four ten-bench open cars built by the American Car Company. These cars will be operated in the city and suburbs of Montgomery, where the railway company has about 25 miles of trackage and thirty-five cars. The attractive amusement resort, Electric Park, is reached by the company's lines. Besides doing a flourishing business in cotton, Montgomery has many manufactories.

The new cars measure 21 ft. over the end panels and 7 ft. ½ in. over the seat ends. The seats are reversible, with the exception of the two seats at each end of the car. The sashes in the bulkhead are arranged to drop into pockets between the seats. Ash, with ceilings of decorated birch, constitutes the interior finish of the cars.



SINGLE-TRUCK OPEN CAR FOR THE MONTGOMERY STREET RAILWAY

The main dimensions of these cars are: Length over the crown pieces, 28 ft. 8⅜ ins.; from the panel over the crown pieces, 3 ft. 10 3-16 ins.; width over the sills, including the plates, 6 ft. 3 ins.; sweep of the posts, 5 ins.; distance between the centers of the posts, 2 ft. 8 ins.; side sill size, 3¾ ins. x 7 ins.; sill plates, ⅝ in. x 7 ins.; thickness of the corner posts, 3⅝ ins., and of the side posts, 2¾ ins.; height of the steps, 18½ ins., and of the risers, 17 ins. The cars are equipped with Brill angle-iron bumpers, sand boxes and "Dedenda" gongs.

PROPOSED METHOD OF CAR SPRINKLING IN CLEVELAND

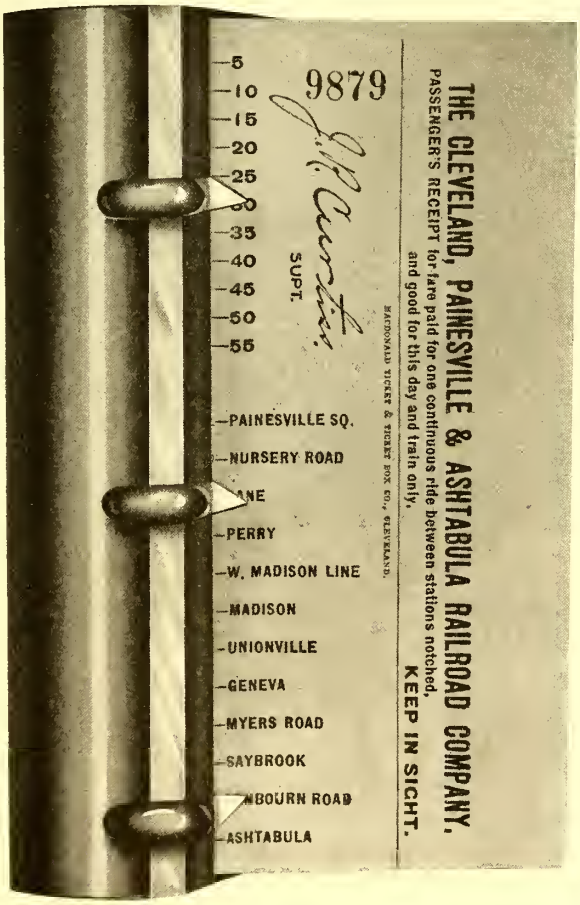
J. J. Stanley, general manager of the Cleveland Electric Railway Company, has an idea that the exteriors of cars can be cleaned economically in the summer by means of a shower bath. He is having rigged up at the Windermere car house a set of huge sprinklers which will throw water on the tops of cars at high pressure. These will be placed over a cement washing basin and a car run under them. After a liberal shower the exteriors will be scrubbed with brushes and soap. Then the water will be turned on again to rinse them off. The scheme has not been worked out, but he believes it to be practical.

The Roxbury Park Amusement Association, of Johnstown, Pa., has officially named its new amusement resort "Luna Park," and announces the formal opening for May 30. The association is composed of citizens of Johnstown, and is capitalized at $25,000. Charles Young is president. The park embraces 35 acres and is readily reached by the local electric railways. It contains, among other things, a half-mile track, baseball field, 3-acre lake, picnic grove of 10 acres, grand stand with 2000 seats, theater with a capacity of 700, boat house, elaborate carousal, free dining hall, dance hall, café, roller coaster, laughing gallery, Ferris wheel and a shooting gallery.

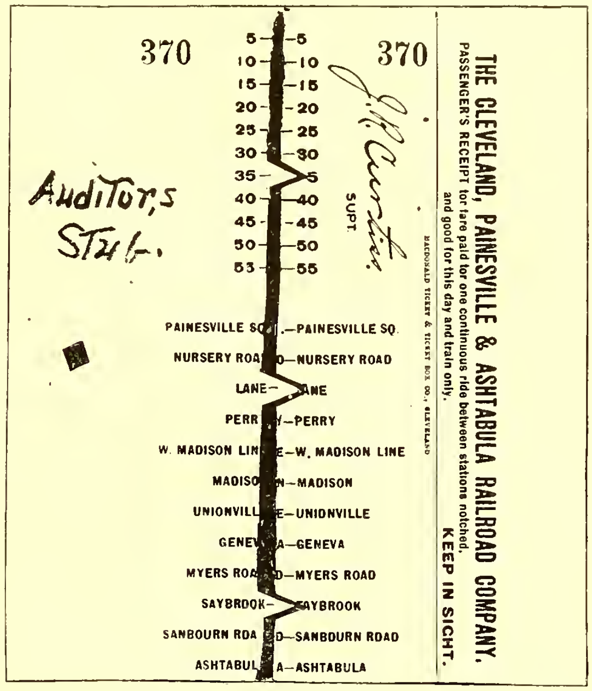
A NEW TICKET-SELLING AND CHECKING DEVICE

The Macdonald Ticket Company, of Cleveland, is introducing a new system of cash fare receipts for interurban roads which, it is claimed, combines the good features of the fare register and the duplex cash receipt used by many roads. The device is attracting a great deal of favorable attention, and it is being used by a number of prominent interurban roads in Ohio and Michigan. It consists of a small metal box or holder, attached to which is a pad containing 100 tickets, numbered in consecutive order, with station names and classification of fares arranged in two parallel columns. The pad is doubled over a plate and then placed in the holder and locked in such a way that a cutter edge engages between and against the columns. Along the top of the box are three movable notches arranged to be set for any combination of stations and amount of fare desired. When a receipt is torn from the pad, the notches leave indentations opposite the stations to be indicated and the amount of fare paid. The auditor's stub, which remains in the box, contains the corresponding projections. Owing to the peculiar construction of the box, the auditor's stub, by a slight pressure of the thumb upon the pad, flies back into the drum and cannot be seen until the holder is unlocked by the proper official.

The box is light and strong, and its operation is simple. It is claimed that it takes less time to work the device than a fare register, and it can be operated anywhere on the car. The conductor cannot see the stubs, as they are securely locked in the box, and he settles upon amounts collected and not upon totals as indicated by the stubs. The stubs enable a company to keep a perfect traffic report of the distance covered by each passenger, and it gives each cash fare passenger a receipt for his money. It is claimed that 90 per cent of the conductors who are dishonest are made so through settling the shortages and retaining the overages. The shortage or overage exists between the auditor's stub and the conductor's cash. It is said that where a conductor is obliged to go into his own pocket to make up a shortage he is pretty certain to attempt to get it back the next day. Hence, it is argued that it is a much better plan to keep the auditor's slips from him and keep a daily record of each conductor's business, charging him with shortages and crediting him with overages. At the end of each month, if there are too many shortages, a conductor should be warned to do better, and if the shortages continue, he should be discharged as dishonest or incompetent. The claim is made that a road which is using the Macdonald box and following this plan, has reduced the shortages to practically nothing and the overages have been more than enough each month to pay for the tickets used in the device. The scheme is well liked by conductors, because it eliminates all bookkeeping from the car and because it removes the inclination to be dishonest.



VIEW OF TICKET HOLDER, SHOWING MOVABLE NOTCHES SET FOR ANY DESIRED COMBINATION OF STATIONS AND FARE



APPEARANCE OF NOTCHED TICKET, AUDITOR'S STUB REMAINING IN BOX

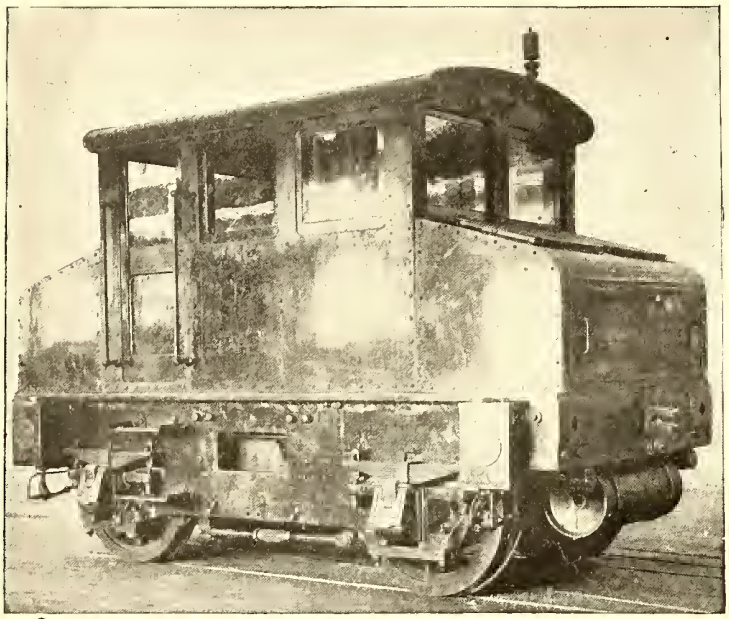
Murdock Macdonald, who is at the head of the company and who designed the device, has been associated with passenger business since the inception of electric railways, and he is thoroughly familiar with the ticket conditions of such roads.

HIGH-TENSION ELECTRIC LOCOMOTIVE FOR SWEDISH GOVERNMENT RAILWAYS

The Swedish Government, which is conducting a detailed investigation as to the feasibility of electricity for trunk lines, has ordered from the Westinghouse Electric & Manufacturing Company an electric locomotive of the type shown in the accompanying illustration. One of the interesting features is the high-trolley voltage for which the equipment is designed, 18,000 volts, though connections are supplied for operating at several voltages lower than this, the minimum being 3000 volts. This high voltage necessitates the use of an oil-cooled main auto-transformer and an oil-break circuit breaker. The intention is to operate at a moderate voltage in towns and thickly populated districts, while a high-trolley voltage will be employed, carried overhead, on the greater part of the line.

The control system is electro-pneumatic and consists of an air compressor driven by a single-phase motor, an air motor on the induction regulator, air cylinders on the circuit breaker and reverser, and the necessary magnet valves. The air brakes and air sanders are also to be supplied by the above compressor. There are two connectors at each end of the locomotive, so that two locomotives can be coupled and operated by one master switch. The master switch is in the middle of the cab, and is so situated that the operator has a clear view in all directions without leaving his seat.

The weight of the locomotive and equipment is 25 tons, all of which is on four 41-in. drive wheels. Two 150-hp, 25-cycle,



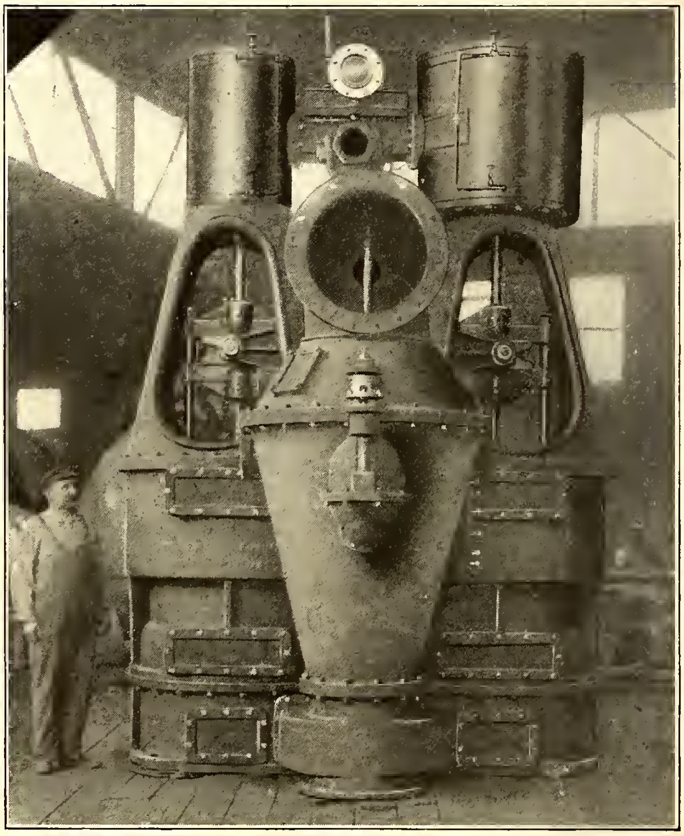
HIGH-TENSION ELECTRIC LOCOMOTIVE FOR SWEDEN

single-phase motors are geared, one to each axle, with a gear reduction of 18 to 70, and have shown an ability to handle a 70-ton train at 40 m.p.h., without exceeding the rise of temperature for which they were designed. The equipment has been so installed on the locomotive as to permit ready access to all parts. Only the small operating devices have been placed in the cab, and the layout is such as to allow the greatest convenience in operation with maximum safety to the operator.

JET VS. SURFACE CONDENSERS

Realizing the desirability of providing for a choice in the selection of either jet or surface condensers, the W. H. Blake Steam Pump Company, of Hyde Park, Mass., has perfected a very extensive line of both types running in capacity from 600 lbs. to 40,000 lbs. of steam condensed per hour with injection water having a temperature of 70 degs. F. In the type of small twin vertical air pump and jet condenser shown in the accompanying cut, the air pump is made with compound steam cylinders when it is to be operated condensing, and with twin vertical steam cylinders when operated non-condensing and the exhaust steam utilized. Being vertical in construction, all pistons wear equally on all sides, and not downward as in the horizontal type. The water cylinders are composition lined, all water piston (or bucket) heads are of the same material and fibrous packed. Easy access is afforded to heads, packing and water valves through a hand hole on either side of pump. The best composition is used in the construction of the water valve seats and guards; the studs are of Tobin bronze, the valves being held in place by lock-nuts and operated without the aid of springs. The water piston rods are of Tobin bronze and the steam piston rods of steel.

The injection stem and cone are of composition, and access to the same is provided through hand holes on either side of the condenser. The amount of water passing through the condenser is regulated by the vertical adjustment of the injection cone, which acts as a nozzle to form a thin spray, which is thrown out at an angle of 45 degs. This falls upon a succession of shelves, thus forming secondary sprays through which the exhaust steam from the engine must pass. Instantaneous condensation results with great economy in the use of water. A perforated copper plate is substituted for the shelves when the force of the injection water is not sufficient to produce spray. The combined volume of injection water and condensed steam flows by gravity through the bottom of the condenser into the pump. To prevent flooding of the engine, the condenser is provided with an independent vacuum breaker attachment secured to the side of the condenser. This is so arranged that when the water reaches the level of the float chamber the float is raised, and by great leverage, forces the check valve from its seat, allowing an inrush of air, which instantly breaks the vacuum, thus preventing further suction of water into the con-



TWIN VERTICAL AIR PUMP AND JET CONDENSER

denser and consequent flooding of the engine. The construction of this machine is exceedingly simple, and all parts are readily accessible; it is very compact, requiring little floor space, and is operated by the Blake automatic valve motion, without complicated mechanical adjustments.

The Common Council of Trenton, N. J., after keeping out of electric railway tangles for a couple of months, is now trying to determine whether the local street railway or the suburban companies should have the right of way where their lines cross each other. At present there is no ordinance or rule in the case, and as the Trenton Street Railway is crossed by the Trenton, Lawrenceville & Princeton Railroad; Yardley, Morrisville & Trenton Street Railway; Camden & Trenton Railway, and Trenton & New Brunswick Railroad, it causes complications. Heretofore it has been largely a question of judgment upon the part of the motormen, and several narrow escapes from accident have shown the necessity for some definite rule as to which company shall have the right of way at the crossings. It is expected that the Council will give the Trenton Street Railway the right of way over all the crossings.

FINANCIAL INTELLIGENCE

Wall Street, April 12, 1905.

The Money Market

There was no appreciable change in the local money market this week. The demand for funds was, if anything, less active, despite the increased volume of business in the securities market, and rates for all maturities ruled practically the same as those heretofore quoted. The inquiry for accommodation was confined largely to the call loan department, and was readily supplied at rates ranging from 2½ per cent to 4 per cent, the bulk of the business being transacted at 3½ per cent. In the time loan department, business was practically at a standstill. Early in the week a moderate demand developed for four-month funds at 3½ per cent, and for six-month maturities at 3¾ per cent, practically all of which was satisfied from abroad. Toward the close, however, the inquiry quieted down considerably, borrowers being disposed to wait for concessions, in view of the accumulation of funds here, resulting from the heavy Government disbursements on account of pensions, transportation of mails, etc., and the influx of money from the interior for various purposes. Local institutions, however, continued to hold the market firm at the above rates, despite the disposition on the part of some of the foreign houses to put out funds against exchange transactions at a shade under the ruling quotation. The commercial paper market was fairly active and firm. Merchants were disposed to put out moderate amounts of paper, and all offerings of choice material were readily absorbed. Rates remained unchanged at 4 per cent for prime indorsements, and 4 to 4¼ per cent for good names. The bank statement issued by the associated bankers on last Saturday made a favorable exhibit. Loans decreased $8,530,100, due in part to the continued shifting of loans to other banks and trust companies. The decrease in cash of $2,622,200 was larger than was generally expected. Deposits were $10,560,600 less than in the preceding week, and the reserve required was $2,640,150 less than a week ago. The surplus reserve increases $17,950 to $8,682,150 as against $22,916,400 in the corresponding week in 1904; $3,741,300 in 1903; $4,571,750 in 1902; $7,938,200 in 1901, and $10,950,275 in 1900.

The situation at the principal European center remained easy throughout the week, except at Paris, where the discount rate displayed a hardening tendency. The open market discount rate at London was 2 per cent; at Berlin the rate was 1⅞ per cent, and at Paris 2½ per cent.

The Stock Market

There was a decided improvement in the stock market this week. Trading in all departments developed much larger proportions, and apart from slight reactions, due to realizing sales, the general tendency of values was toward a higher level. In the early dealings speculation was chilled by the announcement of the contemplated issue of $100,000,000 new stock by the Union Pacific, and prices for nearly all of the leading railway shares sustained substantial reaction. In the later dealings, however, the upward movement was resumed, and apart from the temporary reaction caused by profit-taking sales, the market ruled decidedly strong practically up to the close. A noteworthy feature of the trading was the increase in value of business transacted by commission houses, indicating a keener public interest in the market. Sentiment was decidedly cheerful, as a result of the favorable Government report on the winter wheat crop, the comparative ease in money, further improvement in gross railway traffic returns, and continued activity in all the leading industries throughout the country. Exceptionally strong features of the railroad list were Union Pacific, New York Central, Canadian Pacific, Louisville & Nashville, Atlantic Coast Line, Southern Pacific, and Atchison. Missouri Pacific and others of the Southwestern group were also decidedly strong. St. Paul advanced sharply on report that the stock was being absorbed by the Union Pacific-Standard Oil interests. In the industrial department United States Rubber rose sharply on the restoration of the stock to an 8 per cent dividend basis. United States Steel issue, American Smelter, Natural Lead and Federal Smelting and Refining displayed pronounced strength. The bond market was moderately active and strong, in sympathy with the general improvement in other quarters of the market. At the close the market displayed an easier tendency.

The local traction issues were extremely quiet but firm, especially Brooklyn Rapid Transit, which advanced 2⅛ per cent.

Philadelphia

There was a sharp falling off in the dealings in the local traction issues this week. Fewer stocks were traded in, and the individual transactions were considerable smaller than in the preceding week, and although more or less irregularity developed in the speculative issues, the general tone of the market was firm. Prominent features of the trading were the advance of 1⅛ in Consolidated Traction, of New Jersey, to 85, the highest price on record, and the strength in Union Traction, which rose to 60¼, or ⅜ of a point above the previous high record. American Railways stock made a new high record on the present movement, the price touching 54½, but in the subsequent dealings all of the improvement was lost. Philadelphia Traction held strong throughout, all of the transacactions taking place at 100. Philadelphia common opened firm at 47⅛, but in the late dealings, a moderate selling movement developed, which carried the price off to 46, with a subsequent rally to 46⅜, a net loss of ¾. About 8000 shares changed hands. The preferred lost ¾ to 48 on limited transactions. United Gas and Improvement displayed pronounced weakness throughout the week; the price receding from 117⅛ to 115⅞, with a final rally to 116¼, the latter figure representing a loss of 1½ points. Philadelphia Electric sold to the extent of about 2500 shares at prices varying from 11¾ to 11⅝. Philadelphia Rapid Transit was firm, upwards of 1800 shares changing hands at from 31¾ to 31½. Other transactions includes odd lots of United Companies of New Jersey at 270½, and Fairmount Park Transportation at prices ranging from 21 to 22⅜.

Chicago

Despite the result of the recent municipal election which declared in favor of the municipal ownership of the street railway system, all of the companies are going ahead with the improvements decided upon some time ago, and according to the officials of the different lines, the work will be continued whether or not the city devises means for raising the necessary funds to take over the various properties. It is said that John J. Mitchell, representing the controlling interest in the City Railway Company, has already informed Judge Dunne that the company was ready to turn the property over to the city, providing satisfactory conditions could be arranged. Mr. Mitchell also said that in the meantime the company is going ahead with the development of the system and the rehabilitation. It is said that $6,000,000 has been authorized for expenditures for new cars and equipments, exclusive of what will be spent for additional motive power.

Trading in the street railway stocks was upon an extremely small scale this week, there being no disposition on the part of traders to trade actively, pending further development. Transactions were, in most instances, confined to small amounts, and apart from Metropolitan Elevated preferred, which declined from 63 to 61, the price changes were insignificant. Metropolitan common sold at 22¾ and 23, Northwestern Elevated at 23. Chicago & Oak Park common brought 6, and West Chicago sold at 50.

Other Traction Securities

The feature of the Baltimore market was the pronounced weakness in United States Railway issues, especially the stock and the income bonds, which declined sharply on comparatively light transactions. The first named, after selling at 15 in the early dealings, ran off a full point to 14, on the exchange of about 1000 shares. The incomes were under pressure practically the entire week, the price declining from 64¾ to 62¼, with a subsequent rally to 63, a net loss for the week of 2 points. Upwards of $75,000 changed hands. The 4 per cent bonds were quiet, all transactions taking place at 93 to 92¾. Other transactions included Charleston Electric 5s at 95½, Augusta Street Railway 5s at 104¾, Virginia Electric Railway & Development 5s at 99⅞ to 99½, Norfolk Railway & Light stock at 12½, and Baltimore City Passenger 5s at 108½. Interest in the Boston market centered largely in Boston & Worcester issues, both of which advanced sharply on buying by certain interests, who believe that sooner or later the property will be acquired by one of the steam roads at prices much above the present level. The common was dealt in to the extent of 4000 shares, at prices ranging from 33½ to 34½, while the preferred advanced from 79 to 80, on comparatively light purchases. Toward the close prices reacted, the common closing at 33 and the preferred at 79½. Massachusetts Electric common and preferred displayed extreme weakness, the first named selling from 23 to 20¾, while the preferred dropped from 70 to 68. Near the close there was a fractional rally in the common, and a recovery of a point in the preferred. Other sales included Boston Elevated, at 154⅞ to 155, Boston & Suburban common at 27 to 26¾, the preferred at 75, West End common at from 97¼ to 98, and the preferred from 116¾ to 116. In the New York Curb market Interborough continued to fluctuate widely on a smaller volume of business. In the early dealings the stock was well absorbed, at from 212 to 213, but later in the week all support appeared to have been withdrawn, and the price drifted to 208. In the subsequent dealings there was a full recovery to the high price of the week, but at the close there was another reaction to 206, where it closed. About 7000 shares were dealt in. American Light & Traction common was active and comparatively strong, the price rising 7 points to 95, on report that the dividend on the stock was to be increased. It is said in well informed quarters, however, that no increase will be made in the distribution at this time. The company's earnings are said to be equivalent to 15 per cent on the common stock, but the policy of the management is to build up a substantial surplus. New Orleans Railway new stocks were also quite animated and strong, upward of 2500 shares of the common selling at from 28 to 28¾, while about 1000 of the preferred brought prices ranging from 77 to 77¾. The bonds sold at 92. Washington Railway 4s sold at 89½.

Tractions were comparatively quiet in Cincinnati. Toledo Railways & Light advanced to 35, on sales of about 900 shares. Cincinnati Street Railway was practically stationary at 148½ to 149. Cincinnati, Newport & Covington, preferred, sold at 92. Detroit United sold at 85 and 95½. Cincinnati, Dayton & Toledo Traction at 20½ and 21.

Northern Ohio Traction & Light was particularly active at Cleveland, and advanced from 20 to 22¼, on sales of several hundred shares. Aurora, Elgin & Chicago, preferred, had a few sales at 70, while the common declined to 14½ and 15 on 30 days' future delivery. Western Ohio receipts advanced to 16, on announcement of the financing plan for building the new extension. Muncie, Hartford & Ft. Wayne sold at 44½. Cleveland & Southwestern Traction common, which has been inactive for many months, with a mark of 28, sold this week for $7 per share, but holders are asking 15 for more. Northern Texas Traction advanced to 58½, while the 5 per cent bonds of this company advanced to 97½. Cleveland Electric Railway made a high mark of 85 the middle of the week, but declined to 82 on talk of municipal ownership. Toledo Railways & Light sold at 32 early this week.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	April 5	April 12
American Railways	54	54
Boston Elevated	154½	155½
Brooklyn Rapid Transit	67½	69¾
Chicago City	199	..
Chicago Union Traction (common)	10	9½
Chicago Union Traction (preferred)	42	37¼
Cleveland Electric	82½	81
Consolidated Traction of New Jersey	81	84
Consolidated Traction of New Jersey 5s	110¼	110¼
Detroit United	85¼	84
Interborough Rapid Transit	212¾	206
International Traction of Buffalo	29½	29
International Traction of Buffalo (preferred)	69	68
International Traction of Buffalo 4s	82½	82½
Manhattan Railway	166½	166½
Massachusetts Electric Cos. (common)	21¾	21½
Massachusetts Electric Cos. (preferred)	69	68½
Metropolitan Elevated, Chicago (common)	23	22½
Metropolitan Elevated, Chicago (preferred)	63	61
Metropolitan Street	122⅞	122
Metropolitan Securities	87⅜	86½
New Orleans Railways (common), W. I.	27¾	28⅝
New Orleans Railways (preferred), W. I.	77	77¾
New Orleans Railways, 4½s	—	91¼
North American	102⅞	101½
North Jersey Street Railway	23	25
Philadelphia Company (common)	*47	46
Philadelphia Rapid Transit	31¼	31½
Philadelphia Traction	100	100
Public Service Corporation 5 per cent notes	97¾	97¾
Public Service Corporation certificates	72½	72½
South Side Elevated (Chicago)	—	93½
Third Avenue	130	131¼
Twin City, Minneapolis (common)	120½	118
Union Traction (Philadelphia)	59⅛	60
West End (common)	97¼	97½
West End (preferred)	116	116

a Asked. * Ex-div. W. I., when issued.

Iron and Steel

The "Iron Age" says the consumption of pig iron in the month of March was 2,000,000 tons. The enormous output, as contrasted with former months, is due largely to the record breaking in some of the great districts, like Pittsburg, with its 510,000 tons, the Shenango Valley with 155,000 tons, and the Illinois-Northwest group with its 253,000 tons. But while such records may not be at once repeated, it is a general fact that we are now entering the months when everything conspires to lead to high records. The furnaces usually work best in April, May and June, and the handling of raw material is not impeded.

The enormous consumption is another reminder of the extraordinary industrial expansion of the country, with the iron industry in the van, and justifies the unconquerable optimism of our people. There is a steady flow of moderate rail orders. Some very good tonnage has been placed in the structural shapes, and scarcity for prompt delivery is a feature.

THE SPRINGFIELD SYSTEM SOLD

The deal for the purchase of the Springfield Street Railway Company, of Springfield, Mass., by the New York, New Haven & Hartford Railroad Company was closed April 11, and the formal transfer of securities will be made as soon as possible. The stockholders of the Springfield Company were offered $225 a share for their stock, this option expiring on Saturday, April 15. The New York, New Haven & Hartford Railroad Company, through its underwriting agents, offered the stockholders the entire sum in cash, or for each share held $75 in cash and $150 in the stock of the holding company. The stock issue of the Springfield Street Railway Company is 19,854 shares, and the underwriting agents on April 11 announced that they had already placed 8000 shares upon their books.

The directorate of the Springfield Railway Companies, the holding company, will comprise two stockholders of the Springfield Railway Company, four representatives of the New York, New Haven & Hartford Railroad Company and one representative of the underwriting agents.

SEEING CLEVELAND COMPANY ORGANIZED

J. W. Butler, who has had charge of the special excursions of the Cleveland Electric Railway Company for several years, has resigned from that company and is now passenger agent for the Citizens' Transit Company, which has been organized to operate a series of electric buses in Cleveland. The company proposes to make two runs daily with its accumulator "Seeing Cleveland" coaches, and charge a fare of 50 cents. Each coach will seat 30 passengers. Later more frequent trips may be made. It is also the intention of the company to build several funeral cars, which will have a seating capacity of about 20 people, and will also have room for the casket. The company has been organized with a capital stock of $100,000, with Charles S. Britton as president, H. P. Coe, vice-president, R. J. Venning, secretary and treasurer.

NEW EQUIPMENT FOR BRAZIL

The Rio de Janiero Tramway, Light & Power Company, of Rio de Janiero, Brazil, is preparing specifications for an hydraulic plant, transmission system, and the equipment of its tramway and lighting system in the city of Rio de Janeiro. The company has purchased the two principal street railway properties in the city, which now employ mule power, and will operate them by current taken from a water power 45 miles distant. A temporary plant of 1000 hp, consisting of G. E. generators and Pelton wheels, has already been purchased. The company is controlled by the F. S. Pearson syndicate, and the purchasing agent is W. P. Plummer, of 29 Broadway, New York.

ANNUAL MEETING OF THE METROPOLITAN ELEVATED, CHICAGO

The annual meeting of the stockholders of the Metropolitan West Side Elevated Railway Company was held in Chicago April 5. The following financial report was made:

EARNINGS

	Feb. 28, '05	Feb. 29, '04
Passenger earnings	$2,080,937	$2,065,701
Miscellaneous earnings	80,004	81,452
Total earnings	$2,160,941	$2,147,153

OPERATING EXPENSES

Maintenance of way and structure	$106,701	$64,329
Maintenance of equipment	163,372	149,021
Conducting transportation	700,809	726,790
General expenses	93,778	102,196
Net earnings from operation	$1,096,281	$1,104,815
Other income	5,553	6,030
Net income	$1,101,834	$1,110,846

CHARGES

Interest on bonds	$490,669	$474,353
Rentals	243,095	239,509
Taxes	126,643	139,532
Special	......	41.350
Surplus for stock	$241,425	$216,100
Add surplus from previous year	226,956	10,855
Total surplus February	$468,382	$226,955

GENERAL BALANCE SHEET

Assets

	Feb. 28, '05	Feb. 29, '04
Cost of road and equipment	$30,462,522	$29,249,758
Metropolitan West Side Elevated Railway preferred capital stock in treasury (2919 shares)	291.900	291,900
Metropolitan West Side Elevated Railway first mortgage 4 per cent bonds in treasury	192.000	192,000
Metropolitan West Side Elevated Railway extension mortgage (4 per cent) bonds in treasury	1,500,000	......
Material and supplies on hand	49,794	66,061
Accounts receivable	127,165	86,115
Trustee, extension (4 per cent) bonds	135,331	1,859
Cash	214,902	221,714
Totals	$32,973,616	$30,109,400

Liabilities

Capital stock, preferred	$9,000,000	$9,000,000
Capital stock, common	7,500,000	7,500,000
First mortgage (4 per cent) bonds	10,000,000	10,000,000
Extension (4 per cent) bonds	4,500,000	3,000,000
Collateral loan, First Trust and Savings Bank	1,100,000	......
Interest accrued, not due	52,693	52,693
Taxes accrued, not due	105,501	117,779
Accounts payable	189,808	205,332
Reserve fund for replacement of property	57,230	6,647
Balances	......	787
Balance, profit and loss	468,382	226,956
Totals	$32,973.616	$30,109,400

The traffic record was:

Number of passengers carried this fiscal year	41,694,788
Number of passengers carried previous year	41,372,338
Total increase	322,450
Daily average this fiscal year	114,232
Daily average last fiscal year	113,039
Increase per day	1,193
Per cent of increase	1.06

President McAllister, in his address to the stockholders, first reviewed the mileage of the system and the causes that led to its increase. The question of motor equipment also was discussed. He referred to the old system of operating with electric locomotives, and how by careful inspection of equipment the company was able to increase the length of trains, although the apparatus was called upon to exceed its original rating. The perfection of the multiple-unit system of control blazed the way for improvements, and sixty-eight motor cars were purchased as an initial order. To-day there is a total of 157 motor cars and 262 coaches. The installation of a storage battery proved sufficient to care for the demands made upon the power equipment. It seems advisable here to quote the president as regards earnings and negotiations with the Chicago, Elgin & Aurora. He said:

While the gross earnings of the company have not shown much increase, due largely to the general depression in business in the city of Chicago, the operating expenses have been fairly satisfactory, particularly when you take into consideration the following facts: The operating expenses show an increase over the previous year of $22,322, or 2.14 per cent, divided as follows:

Maintenance of structure and equipment shows an increase of $56,951, or 26.72 per cent, while the conducting transportation and general expenses show a decrease of $34,628, or 4.18 per cent.

There was charged to maintenance expenses during the year $50,582, which was set aside as a reserve for maintaining the property. Had this reserve fund not been charged operating expenses would have shown a decrease of $38,260.

In addition to the above there was charged in the conducting transportation expenses $5,250, due to the settlement of claims on account of the fog accident of Nov. 19, 1901. This amount, being comparatively small, was not shown as other deductions from income, as was the case in previous fiscal years.

For over a year we have had before the City Council an ordinance, and have been carrying on careful negotiations with the Aurora, Elgin & Chicago Railway Company, with a view to arranging to bring their trains down town into your Fifth Avenue terminal. We are now able to report the successful conclusion of these negotiations. On Feb. 23, 1905, the Council passed an ordinance granting your company permission to run the trains of the Aurora, Elgin & Chicago Railway into your Fifth Avenue terminal.

H. G. Hetzler, superintendent of the Chicago division of the Burlington Railroad, in charge of freight and passenger traffic, has been chosen to fill the vacancy caused by the resignation of President Dickinson MacAllister, but only four directors were elected: C. C. Adsit, R. F. Clinch, F. A. Delano and Benjamin Allen. The retiring directors are Dickinson, MacAllister and Clarence S. Day. Other officers were re-elected as follows:

George Higginson, Jr., vice-president, secretary and treasurer; P. D. Sexton, assistant secretary and treasurer; S. C. Matthews, auditor; H. M. Brinckerhoff, general manager; W. W. Gurley, general counsel.

SEASIDE IMPROVEMENT OF THE B. R. T.

Having successfully solved last year the problem of caring for traffic at its Coney Island terminals, the Brooklyn Rapid Transit Company is this year engaged in a similar work at Brighton Beach, and hopes to have all the changes worked out in detail before the opening of the season at that resort, and at Manhattan Beach, which adjoins it. These improvements are chiefly for the surface lines, which now terminate at Brighton in a series of loops, at the back of the Brighton Beach Hotel. The elevated lines to the resort are operated through to Coney Island, so that the present facilities for these, which were considerably improved last year, are considered adequate.

Access to the surface lines has been through two entrances, one at either end of the hotel. Of these the one to the west leads directly to the music hall, while the one to the east leads to the piazza of the hotel and the board walk facing the ocean. The trouble has been that passengers would flock through these passageways and onto the tracks before passengers arriving had been discharged. This, of course, resulted in confusion and delay.

To obviate this difficulty in the handling of traffic, two stations are to be built, at which all unloading and loading will be done. One of these will be to the east of the terminal grounds, and the other to the west. Incoming cars will swing to the west, discharge their passengers, take the loop and load at the platform on the east. As at Coney Island, the terminal will be so laid out that confusion between incoming and outgoing passengers will be impossible. The stations will, however, be connected by an overhead bridge for general convenience.

In connection with these improvements it is interesting to note that a change of ownership in Manhattan Beach will result in the partial rearrangement of that resort, and the addition thereto of features of amusement that will vie with anything Coney Island has to offer. Heretofore, Manhattan has been for the so-called elite. Now there are to be a Boer War and other similar attractions. Perhaps the most important improvements will be those of the Manhattan Beach Land Company. These include a scheme to colonize the beach, which has for its object the building of up-to-date dwellings on newly-made streets. Already, all the land to the west of Pains' Fireworks building, up to the point where the property of the Manhattan Beach Company joins that of the Brighton Beach Company has been secured. Leases for additional property are being negotiated. These, with other changes in contemplation, will lend greatly to the attractive power of the beach, and should result in considerable additional traffic for the Brooklyn Rapid Transit Company, as Manhattan will now be easily accessible from Brighton. Then, too, additional amusement features proposed for Brighton Beach will result in the carrying of more passengers direct to that resort.

MERELY A DIFFERENCE OF OPINION

Mayor-elect Dunne, of Chicago, was lionized at a meeting in Cooper Union, New York, on Friday evening, April 7, at which W. R. Hearst, Tom Watson, Professor Bemis and others were present. Mr. Dunne made a speech telling what it is planned to do in Chicago, and reviewed briefly the history of the municipal ownership movement. He said he has no fear for the success of the movement. It is his purpose to carry out every letter of the platform on which he was elected, which declared unequivocally for immediate municipal ownership. He did not formally commit himself to any course of action, but from what he did say the conclusion is logical that it is proposed to negotiate for the existing properties. As to the matter of finances Mr. Dunne said:

"We in Chicago propose to raise all the money necessary to purchase an up-to-date street car system upon street car certificates, which are special or limited promises to pay out of the income collected from the system. They are not general promises to pay, which will entail taxation. They are secured under our law in three ways: First, by the pledge of all of the income in perpetuity of the municipal street railway plant. Second, by a mortgage, which conveys all of the tangible property in the transportation department of the city. Third, these certificates are secured by twenty-year franchises, which become operative in the holder on default by the city for one year."

In the afternoon of the day on which Mr. Dunne spoke in New York, Judge Peter S. Grosscup, of Chicago, the guest of the Traffic Club, of Pittsburg, gave an interview to the press, in which he said:

"Mayor-elect Dunne cannot make good his promises for municipal ownership of the street railways of Chicago. In the first place, Chicago has not enough ready money to take on such a thing. Chicago is hardly ready for this anyway. I am not in favor of municipal ownership of railways from an economic standpoint. I am not in favor of it in any city. These enterprises can flourish better, giving better and more efficient service to the public if conducted by private concerns as they are to-day.

"Municipal ownership is a species of socialism that leads to the extinction of the individual. It has been a failure wherever it has been tried."

A CLAIM FOR PERPETUAL FRANCHISES IN CLEVELAND

A claim for perpetual franchises on certain of the most important of the Cleveland City Railway lines has been made by Judge W. B. Sanders, attorney for the company. The statement was made in the course of a hearing before Judge Taylor, of the United States Circuit Court, in an argument for a temporary injunction against the Forest City Railway Company to prohibit that company, which plans to charge a three-cent fare, from taking possession of the Central Avenue route, and to enjoin the city from protecting the company in its efforts to secure this route. On Jan. 11, 1904, the city gave the Forest City Company a franchise on Central Avenue which was to take effect on March 22, 1904, when the city claimed the franchise of the Cleveland Electric Railway expired. A temporary restraining order prevented the three-cent fare company from taking possession at that time.

Judge Sanders based his assertion regarding the perpetual franchise upon the claims that the Central Avenue line was a part of the old East Cleveland Railway system which was granted the right to operate a street railway system under a State law which did not limit the life of the franchise. He claimed the same for the Euclid Avenue route.

Mayor Tom L. Johnson is inclined to exaggerate the claims of the company. He states that the company's position means that any ordinance extending the life of any branch or extension has the effect of extending the life of the grant of the entire system. He will use this argument as ammunition in his municipal ownership campaign. Since this announcement the franchise for the Doan Street crosstown line has come up before the Council, and the matter has been referred for further consideration.

Officials of the company decline to make any statement relative to the claims of the company other than to point to the argument set forth as outlined. Arguments in this case will be continued this week.

Mayor Tom L. Johnson, of Cleveland, who will be a candidate at the next municipal election to succeed himself, has announced that he will conduct his campaign along the same lines that carried Judge Dunne to victory in Chicago. Mr. Johnson's three-cent fare schemes have all come to naught, but he insists that he will go into the fall campaign with the municipal ownership of street railways as the principal plank in his platform.

A RADICAL RAPID TRANSIT MEASURE

A radical rapid transit bill affecting New York City was introduced in the Assembly on April 7. It requires the approval of the Board of Estimate and Apportionment on the establishment, abandonment or alteration of any rapid transit route in New York City; establishes a five-cent fare for the first five years of operation, except between the hours of 5 and 9 a. m., and 4 and 8 p. m., on week days, when it shall be two rides for five cents; makes a two and one-half cent fare after five years, and provides for transfers to all rapid transit systems to be constructed in the future. A statement given out with the bill says that the bill in effect forbids the Rapid Transit Commissioners from making any contracts which shall deprive them or their successors of the right of public supervision and making rules from time to time to determine the speed and frequency of trains. A sufficient space must be left on either side of the railroad for safe egress in case of danger, and the subways hereafter built must be rendered safe against fire, flood, leakage and inundations; the cars also must be safe and fireproof, and equipped with extra central doors for the rapid despatch of traffic.

TALK OF SUBWAY FOR BALTIMORE

Agitation continues for the construction of a subway for street cars in the business section of Baltimore. At the request of B. N. Baker, president of the Baltimore Trust & Guarantee Company, Engineer Phelps has prepared tentative plans and an estimate of the cost of building such a system. He estimates the cost of constructing the proposed 4.05 miles of line at $3,120,000, and says that the work could easily be completed in two years. In general, construction will be of concrete and steel, involving a single track at some places, and a double track at others. Where the tunnel is built for a single track, it is proposed to have a double-deck system, to avoid collisions at turnouts. The route proposed is along these streets: Baltimore, from Greene to Centre Market Space; Charles, from Centre to Pratt; Fayette, from Liberty to Calvert; Lexington, from Liberty to St. Paul; Saratoga, from Charles to Park Avenue; German, from Charles to Light; Eutaw, from Lexington to German; Hanover, from Baltimore to German; Sharp, from Baltimore to German; Calvert, from Baltimore to Lexington; North, from Baltimore to Fayette; Gay, from Baltimore to Saratoga. Station points are provided as follows: On Baltimore Street at Gay, North, Calvert, Charles, Hanover, Sharp, Liberty, Howard, Eutaw and Paca Streets; on Charles Street at Lombard, German, Fayette, Lexington, Saratoga and Mulberry Street.

INTERURBAN BARRED FROM TOLEDO

The city of Toledo has carried out its threat of preventing interurban cars from crossing the Cherry Street bridge over the Maumee River, which is said to be unsafe for heavy cars. Cars of the Lake Shore Electric Railway and the Toledo, Port Clinton & Lakeside Railway were prevented from crossing March 28, and since then they have not operated into the city. The Maumee Valley Railway & Light Company was enabled to keep its service open by operating all cars by way of the line on the west side of the river, its lines forming a loop extending up either sides of the river. The Toledo, Bowling Green & Southern Traction Company is not interfered with, as it recently completed its own bridge over the river near Maumee. This, however, is too far south to be available for the other lines. The Lake Shore Electric Railway decided to operate cars only to the city limits and transfers passengers to city cars which are appropriately marked. The Lakeside Company operates cars almost up to the bridge. The interurban companies were asked to pay part of the expense of strengthening the bridge, but they declined, claiming that the city company was responsible for their cars while on city tracks. The city company is not especially concerned, because its cars are comparatively small, and their operation has not been interfered with. In view of the refusal of the interurbans to pay part of the cost, the city has voted to expend about $15,000 in strengthening the bridge, which it is claimed will give it sufficient strength to carry cars of twenty-five tons weight for five years, or until another bridge can be built. This of course does not provide for the interurbans, as it is claimed it would take an outlay of about $10,000 additional to make the bridge strong enough for them. Thus far it is claimed that the embargo has not seriously effected the business of the interurbans, as their cars are promptly met by city cars appropriately marked, and tickets are sold as heretofore. The transferring of baggage and freight is the most serious inconvenience. Toledo business men are stirred up over the situation, as they claim it will lose them trade if it continues. It is believed that some sort of an arrangement will be made to overcome the difficulty.

IMPORTANT CHANGE IN THE MARINE ENGINE & MACHINE COMPANY

The recent announcement that the Marine Engine & Machine Company had purchased all of the drawings, patterns, etc., of the later types of the well-known Armington & Sims high, medium and slow-speed engines, is followed by that that the company will actively enter the steam field with this machine, as stated in this paper for March 18.

Gardiner C. Sims, under whose personal direction and supervision Armington & Sims engines were designed and have been built, has acquired an interest in the Marine Engine & Machine Company, and will become its general manager. The company is now engaged in building these engines under his personal direction and supervision, which affords ample guarantee that the always high-class character of materials and workmanship heretofore entering into the construction of Armington & Sims engines is carefully considered and fully maintained. From time to time the company will make such changes and improvements in the engines as may be found necessary to keep pace with the varying demands of the grade.

The company will manufacture Armington & Sims engines as heretofore, in sizes ranging from 10 to 3000 hp, and in types horizontal and vertical, side and center crank, single and in pairs, simple and non-condensing, high, medium and slow speeds, with single and Corliss valves, and adapted to direct-connected, belted or other power transmitting requirements. With its modern and roomy machine shops and foundries, both amply equipped with all necessary special tools and appliances for doing large and accurate work rapidly, the company is in a position to make prompt deliveries of any of the sizes and types of engines.

The undoubted merit and popularity of Armington & Sims engines seems fully attested by the fact that upwards of 6600 of them have been built and sold in all parts of the world.

BROOKLYN RAPID TRANSIT COMPANY TO BID FOR SUBWAYS

The Brooklyn Rapid Transit Company will bid for the construction of new subway lines in New York. It was first intimated that this was the company's purpose by the request that it made of the Rapid Transit Commissioners a few days ago for all maps prepared by the engineer of the commission affecting in any way the Brooklyn route. Following up this move the company, at the meeting of the commission on Thursday, Aug. 6, submitted new and elaborate plans, not only for routes in Brooklyn, but for lines in Manhattan Borough calculated to serve most efficiently the immense traffic to that borough from Brooklyn.

The plans of the company for lines in Brooklyn differ somewhat from those suggested to the commission by the committee on plans and contracts of that body. In behalf of the proposals of the company, President Winter appeared before the committee and submitted a map showing all the proposed lines and the changes in the original plans. Mr. Winter thinks the lines so far laid down for Brooklyn travel in Manhattan are not adequate, and that under the river tunnels should extend as far north as Fourteenth Street. Mr. Winter plans for his company a Lafayette Avenue tunnel as a substitute for the line under Gates Avenue, in Brooklyn. This line is proposed because it reaches the objective point by a straighter route; avoids two sharp curves, and better divides the business with the company's Lexington Avenue line. Ridgewood and Brownsville have received especial attention. Both are growing rapidly, more especially Brownsville, which has experienced an unprecedented growth since the operation of cars from there over the Williamsburg Bridge. An important line proposed is that from Blackwell's Island Bridge through Jackson, Manhattan and Driggs Avenues and Roebling Street, and its continuation beyond Gates and Bedford Avenues to a possible junction with the proposed line on Eastern Parkway and the Brighton Beach line of the company, making a cross town line connecting Flatbush district, Greenpoint and Long Island City, and forms an important and direct route via Blackwell's Island Bridge from the heart of Brooklyn to the upper part of Manhattan Island.

In regard to lines in New York (Manhattan Borough) the company is of the opinion that those thus far proposed for Brooklyn travel in Manhattan (viz., on Centre and William Streets, from Delancey to Old Slip) are not adequate, nor would they carry people of Brooklyn far enough across nor far enough north in Manhattan to bring them within easy walking distance of their offices, stores, or shops. It is estimated that 20 or 25 per cent of the people working south of Fourteenth Street, in Manhattan, live in the borough of Brooklyn, and it would seem that any subway plan made with reference to this business should afford a continuous ride as far north in Manhattan as that street. To accomplish this it is essential, so Mr. Winter says, that the lines of the operating company should extend north of Delancey Street, and west of Broadway, and suggests University Place, Wooster, Canal, Centre and William Streets on the east, and Eighth Avenue, Hudson Street, Duane and West Streets on the west; with connecting loops at Fourteenth Street on the north and Cortlandt Street and Maiden Lane on the south. With this plan, supplementing or in substitution of others before the commission, continuous transit would be established between a large part, and in connection with the lines of the Brooklyn Rapid Transit Company, every part of Brooklyn and the entire district of Manhattan south of Fourteenth Street.

After a long session of the committee on plans and contracts of the Rapid Transit Commission on Monday, April 10, it was announced that the Brooklyn Rapid Transit Company will have an opportunity to bid on future subways for Brooklyn and their Manhattan connections. Controller Grout is quoted as authority for the statement that bids will probably be received next fall, though as yet no definite announcement can be made.

THE SALES OF ELECTRICAL APPARATUS

A rumor was current on Wall Street this week that a working agreement which is said to have existed between the General Electric and Westinghouse Companies in regard to patents had been discontinued. Inquiry at the office of both companies, however, resulted in the positive denial that there was any change in the relations of the companies.

NEW PUBLICATIONS

R. Oldenbourg, of München, Germany, publisher of the transportation periodical formerly called "Elektrische Bahnen," announces that since Jan. 1905, the title has been changed to "Elektrische Bahnen und Betriebe," devoted to all transportation interests including electric railways, electric telpherage, electric canal boat hauling, etc. The issues per year have been increased from 24, having 16 pages per issue, to 36, having 20 pages per issue, but the subscription price, 16m ($4.00), remains unchanged.

Experimental Researches on the Flow of Steam Through Nozzles and Orifices, by A. Rateau. Translated from the French by H. Boyd Brydon. D. Van Nostrand Company; 76 pages. Price, $1.50.

As pointed out by the translator, this is a report of the experiments undertaken by Prof. Rateau for determining the fundamental problem evolved in the designing of steam turbines, namely, the proportioning of the nozzles or passages which shall permit the steam to transform its pressure into vis viva. The book is one of the steam turbine designer rather than the user. To the subject matter is added a note on the flow of hot water.

The Testing of Continuous Current Machines, by Charles Kinzbrunner, A. M. I. E. E. John Wiley & Sons; 326 pages. Price, $2.00.

This work is intended for students at technical colleges and schools. Its purpose is to prepare the student for his laboratory work, to explain the purpose of the various experiments, and to give him exact instructions for carrying them out. The work is further intended both for electrical and mechanical engineers who are engaged in test-room work, or in installing, starting and supervising electrical machinery. The book is profusely illustrated, and should prove of practical value to students and engineers as a practical reference work on tests of continuous-current apparatus.

Gas Engine Design, by Charles Edward Lucke, Ph. D. D. Van Nostrand Company; 254 pages. Price, $3.00.

The purpose of this book is to present in compact form those principles which underly the design of gas engines, together with such data as seem reliable for the use of those engaged in building this kind of machinery, and who are familiar with its characteristics. The qualitative or inventive side of design is purposely omitted, and the book is concerned entirely with the quantitative side of design, and treats solely of the forces in, and the energy-transforming power of, the standard mechanism of the exploding gas engine. The work is divided into three parts. The first, treating of power, efficiency and economy, gives the material necessary for deciding on the necessary piston displacement for any specified output for any kind of gas, and enables the designer to approximately predict economy. The second part contains the data and method for determining the stresses in the parts, and the number and arrangement of cylinders necessary for balance or turning effort to meet the specifications. The last part is entirely concerned with the dimensions of the parts to resist the stresses, both by theoretic analysis and by empirical formulas, showing between what limits every principal dimension should lie.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED APRIL 4, 1905

786,373. Brake Shoe; James F. Morrison, Chicago, Ill. App. filed Jan. 9, 1905. Comprises a cast malleable-iron shell having rounded and thickened corners, and a filling of frictional material.

786,378. Mechanical Power Brake; Louis Pfingst, Boston, Mass. App. filed Jan. 23, 1904. A brake spindle capable of being operated by power through actuating clutch mechanism, and bv hand-power and spindle mechanism independent of any power mechanism.

786,379. Power Brake; Louis Pfingst, Boston, Mass. App. filed July 13, 1904. A rotating hand-power brake spindle or shaft-motor geared, and capable of being rotated by a revoluble electric motor transmitting power through clutch and gear mechanism to apply the car brakes, and hand-power and spindle mechanism independent of the motor mechanism, the motor-shaft and spindle having independent alinement centers.

786,393. Street Car Safety Guard; Charles A. Willard, St. Louis, Mo. App. filed June 20, 1904. Consists of a movable guard adapted to project from the rear of the car, a signal including a movable target or shield disposed at the front of the car for notifying approaching cars of the position of the guard, and means for simultaneously supplying a fluid under pressure for actuating the guard and target.

786,465. Brake Shoe; William M. Simpson, Chicago, Ill. App. filed April 4, 1904. A brake shoe comprising a body, and a back therefor provided with a transversely curved front face and having a longitudinal rib on its back.

786,472. Insulator for the Conductors of Electric Railways; Frank D. Ward and Harry C. Furniss, Hanwell, England. App. filed July 11, 1904. The insulator is so constructed as to permit a slight vertical movement of the conductor, while restraining lateral movement.

786,489. Automatic Trolley Pole Controller; Martin O. Dolson, Los Angeles, Cal. App. filed July 28, 1904. Pneumatic means for controlling the trolley pole, and means when it reaches the limit of its excursion in either direction whereby it automatically lifts a slide-valve for controlling such automatic means.

786,564. Device for Operating the Switches of Street Railways; Elbridge G. Howe, Millbury, Mass. App. filed May, 24, 1902. Details of a device adapted to be carried upon the platform of a street railway car for the purpose of opening or closing the switch of the street railways.

786,628. Electric Indicator for Railways; Pierre I. Chandeysson, North Judson, Ind. App. filed Feb. 13, 1904. By this system the location and progress of trains is indicated by suitable indicators in the various stations. Also indicates any break in the track or obstruction thereon.

786,688. Automatic Street Railway Switch; William S. Snyder and William H. Barker, Pittburg, Pa. App. filed April 25, 1904. Consists of a pair of magnets connected to the switch bar by suitable levers and operated by electric contact between the trolley pole of the moving car and a swinging contact-arm in circuit with the said magnets.

PERSONAL MENTION

MR. GEORGE B. LANGLEY, president of the Millville Traction Company, of Millville, N. J., has resigned, as has his son, Mr. E. Lee Langley, the general manager of the road.

MR. THOMAS LOWRY, president of the Twin City Rapid Transit Company, of Minneapolis, Minn., has returned to the United States from a three months' tour of Southern Europe.

MR. BION J. ARNOLD has just been appointed consulting engineer of the Grand Trunk Railroad Company to report on the equipment with electricity of the steam railroad tunnel of that company between Windsor and Detroit.

MR. GEORGE BARSTOW SHEPLEY, president of the Shepley & Field Contracting Company, of Worcester, Mass., and formerly superintendent of construction for the Worcester Consolidated Street Railway Company, is dead.

GEN. W. A. BANCROFT, president of the Boston Elevated Railway Company, was the speaker of the evening at a smoker held by the Elysian Club, of Boston, on April 6. His subject was street railway practice in Europe and America.

MR. JOHN OLMSTED, president of the Springfield Street Railway Company, of Springfield, Mass., interested in many important industries in that and neighboring cities, died April 6, after a long illness, following an attack of grip. Mr. Olmsted was born in Enfield, Conn., June 1, 1820, and entered business at the age of twenty. He is survived by a daughter, Mrs. J. Beebe.

MR. JAMES DALRYMPLE, manager of the Glasgow municipal tramways, has accepted an invitation from Mayor Dunne, of Chicago, to visit Chicago and give the city authorities the benefit of his advice on municipal street railways.

MR. MAURICE COSTER, who for a long time was head of the sales department of the French Westinghouse Company in Paris, has been appointed manager of the export office of the Westinghouse Electric & Manufacturing Company, with headquarters in New York. Mr. Coster succeeds in this office Mr. F. B. H. Paine, who recently entered the employ of the Ontario Power Company.

MR. C. F. POWELL, formerly manager of the Cleveland office of the Westinghouse Company, and for the last two years assistant manager of the British Westinghouse Company at London, has been appointed general agent of the Westinghouse Company at New York. Mr. Powell succeeds Mr. Calvert Townley, who recently accepted an executive position with the New York & New Haven Railroad Company at New Haven.

MR. E. A. RICHARDS, who resigned on April 9 as assistant superintendent of the Boston & Worcester Street Railway Company, has accepted the position of superintendent of the Providence & Taunton line of the Massachusetts Electric Companies. Mr. Richards will thus become associated with Mr. Arthur C. Ralph, formerly general superintendent of the Boston & Worcester Street Railway, in the management of the three lines of the Massachusetts Company, constituting one division of that company.

MR. A. C. EMERICK, recently appointed auditor of the International Railway Company, of Buffalo, was born in Syracuse, N. Y., in 1869, and was educated in the grammar and high schools of that city. In 1892 he went to Buffalo. Four years later he entered the employ of the Buffalo Traction Company, then in its infancy, and was put in charge of the consent corps. In October, 1897, when the operation of cars began, Mr. Emerick was made auditor. He held that position until the absorption of the company by the International Traction, and was retained by the latter as chief clerk in the auditing department. In 1901 he was appointed assistant auditor of the International Railway Company, which position he held until the change of management March 1, this year. Then he became acting auditor and had full charge of the department until his appointment was made permanent April 1.

A. C. EMERICK

MR. D. F. CARVER, formerly chief engineer of the railway department of the Public Service Corporation of New Jersey, has been appointed superintendent of the Rochester Railway Company, of Rochester, N. Y. Mr. Carver began his railroad career with the Pennsylvania Railroad Company, being in the employ of the construction department. He rose rapidly to the position of assistant engineer under the third vice-president, and in 1894 resigned from the company to become connected with the engineering department of the Brooklyn Rapid Transit Company. In 1900 he resigned from the Brooklyn Company to become chief engineer of the Cleveland Electric Railway, and in June, 1903, he accepted the position with the Public Service Corporation. Here he was in charge of cars, car houses, track, roadway, buildings and low-tension distribution.

MR. C. N. WILCOXSON, for the past four years general superintendent of the Western Ohio Railway, of Lima, Ohio, has been appointed general superintendent of the Cleveland & Southwestern Traction Company, of Cleveland, to succeed Mr. H. A. Nicholl, who recently resigned to become general manager of the Indiana Union Traction Company, of Anderson, Ind. Mr. Wilcoxson is an old steam road man, but has been identified with the electric railway business for a number of years. Before going with the Western Ohio he was general manager of the Decatur Traction & Electric Company, of Decatur, Ill., and previous to that he was with the Citizens' Street Railway, of Muncie, Ind. He has been responsible for many of the innovations which made the Western Ohio one of the best operated high-speed traction properties in the Central West. In his new position he will be in charge of about 140 miles of road.

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NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 8000 *copies are printed. Total circulation for* 1905, *to date,* 131,550 *copies—an average of* 8222 *copies per week.*

Periodical Meetings of the Heads of Departments

In the last issue of this paper we published some particulars of the daily meetings of an "investigating committee" composed of the heads of the different departments connected with the South Jersey Division of the Public Service Corporation, and in this issue we describe the semi-monthly meetings of the heads of departments, which were instituted on the same road some time ago. The meetings first described are directly for improving the service, while those mentioned in this issue have indirectly the same object in view, as their purpose is the study of street railway conditions and the methods of other companies, especially their applicability to the Camden system. It is by no means an uncommon thing for the management of a street railway company to hold periodical meetings of the heads of the departments. We believe, however, that one feature adopted at Camden is unique, and that is that special attention is given to articles and other information on street railway practice which have recently appeared in the technical press. The publishers of technical papers which appeal to a particular line of industry, like ourselves, realize perhaps more than anyone else that no paper of this kind can publish all of the information and news which the operating force of a progressive company requires. We believe it to be equally true, however, that the information contained weekly in our columns could be of greater benefit than it now is to many railway companies. No manager or corps of street railway operating men can afford the time personally to look into the multifarious new methods and apparatus which are used on other roads operating in widely different sections of the country and even of the world. Nevertheless, it is self-evident that with so many men working upon largely the same problems, as in this country, very valuable suggestions to be adopted directly or in part can be obtained by a study of the practice followed elsewhere.

The method followed in the Camden association, several of whose sessions are reported in this issue, is to discuss twice a month the articles and announcements which have appeared in the intervening two or three issues of the Street Railway Journal, or any recent article which has attracted the attention of some member elsewhere, and to consider the bearing, if any, which the practice described has upon the service of the company with which the members are connected. To assist in bringing out these points, the committees have been appointed covering the principal branches in railway work. An especially noteworthy feature is a committee on advertising, whose duty it is to carefully scan the announcements of manufacturers, and to report, at the next meeting, such features of new apparatus as they think may prove of value to the company.

The subject is such an interesting one that we shall be glad to learn whether the practice is followed on any other road. We expect to publish other articles, in early issues of this paper, of the meetings of the heads of departments elsewhere, and also to offer certain suggestions as to fruitful methods of reading and utilizing a technical paper.

Side Entrance Interurban Cars

In another column we publish an extended communication advocating the adoption of a side entrance or, as it is sometimes called, a center entrance type of construction for interurban cars. The author of this communication, although not wishing his real name to appear, is a gentleman whose position in connection with the operation of a large city and interurban railway system is sufficient to command respectful attention to the arguments set forth in favor of the side entrance car. And even were this not the case, electric railway men generally will be forced to assent to the soundness of many of the arguments presented. Summing up briefly, his line of argument is this: Interurban roads must in some way provide for an increase in the number of cars at certain times to take care of extra heavy travel. Increasing the number of trains so as to divide by two the regular schedule interval of sixty or thirty minutes between cars is likely to cause too much delay at meeting points and too much of a chance for demoralizing the schedule. The running of two or more cars as different sections of the same train invites rear-end collisions and causes delay at meeting points at times of heaviest travel when delay is least permissible. Adding trailers to each motor car puts additional load on the motors at the very time when, on account of the increase of travel, it would be most difficult for the motor cars to maintain schedule even were they not loaded down with trailers. The conclusion is therefore reached that the only satisfactory way is to operate motor cars and trains by the multiple-unit system. However, if two ordinary interurban cars are coupled together when operating over city streets, the great overhang of the platforms necessitates an unsatisfactory draft rigging because of the short radius curves. Our correspondent therefore believes that a side entrance car should be adopted, first to avoid this overhang, and also to secure several other advantages going with center entrance cars. The argument appears to have very strong points, and it would be interesting to hear from other city and interurban railway operating men on the subject.

Improvements in Elevated Cars

Elevated and underground cars represent the most refined practice in the electric railway art, with the possible exception of some of the higher speed interurban roads which have been built lately. Although in many respects the conditions to be met on elevated motor cars are not as severe as those encountered on surface lines, the weights of the trains, the comparatively high speeds attained between stations and the large number of passengers carried, call for the best skill of the electric railway engineer in providing motors and rolling stock. For this reason considerable space has been given in the columns of this journal in the past few years to the rolling stock of the various elevated roads of the country as well as to that of the New York Subway. The car wiring of the new all-steel subway cars was elaborately described in our issue of March 4 by L. B. Stillwell, and in the present issue we are able to present an article describing a number of important improvements in the rolling stock of the first elevated electric railway of this country, namely, the Metropolitan, of Chicago.

A great deal of attention has been given recently to the wiring of elevated and subway cars. In the case of the latter the question of safety to passengers demands the most fireproof car construction possible and car wiring least liable to start a fire. On elevated roads the danger to passengers from fire is nothing like as great as in a subway, but the managements of the majority of the elevated roads in this country have come to consider that good car wiring is about the best insurance that can be carried against fire as well as against accident claims from badly scared passengers. Both the New York Subway and the Metropolitan Elevated cars represent the latest development in car wiring. In the case of the Metropolitan Elevated there was not only the problem of installing new equipments where continuous steel floors made fireproof wiring easy, but there were numerous old equipments to be overhauled and brought up to as nearly as possible the standard of the new. Extensive use was made of sheet steel under the car floors wherever electric wires existed. In this respect the practice of the Metropolitan Elevated differs from that of other companies where such overhauling of car wiring has recently been done and where fireproof materials on the order of asbestos have been used.

Another notable thing about the Metropolitan Elevated equipment is the use of an automatic system of air brakes which behave in response to the motorman's brake handle almost exactly like a straight air-brake system, thus securing at once the safety of the automatic air brake and the simplicity in handling of the straight air brake.

Tickets vs. Cash Fares on Interurban Lines

A paper read by F. D. Norviel at the April meeting of the Indiana Electric Railway Association, printed in abstract elsewhere in this issue, advocates strongly the adoption by interurban roads of the system of having all passengers, as far as possible, purchase tickets of regular ticket agents rather than pay cash fares to the conductor. In other words, he favors practically the steam road system of handling passenger business. Mr. Norviel, being himself an ex-steam road man and being connected with a large interurban system which is to a large extent officered by ex-steam road men, is in a position to realize the advantages of steam road ticket systems better than some others. There are many interurban managers who will disagree with him on several of the points at issue. We know of some who take position that steam railroad methods are too cumbersome and involve too much red tape to be adopted by the electric interurban road. It has been one of the strong points of the electric road, so far, that it has been able to get along without a lot of red tape, which seems to be necessary in steam railroad operation, and it is desirable to keep away from it as long as possible. Nevertheless, Mr. Norviel is right in pointing out the fact that the larger an interurban system grows the greater the necessity for selling tickets rather than taking cash fares on the cars.

All interurban roads seem to be drifting toward more complicated ticket systems, whether they will or no, and it is frequently hard for the interurban manager to tell where to draw the line. On short interurban roads there is hardly a question but that a ticket system involving a lot of agents and a great stock of different kinds of tickets is more of a nuisance than a benefit. When it comes to a system of 50 miles to 150 miles, with various ramifications and connections with other roads over which it is desirable to sell interline coupon tickets, it seems out of the question to throw the greater part of the work of selling transportation on the conductors, unless provision is made for the collection of fares by divisions, and that is a nuisance from the passenger's standpoint.

We are inclined to think that most interurban roads will have to take a middle ground on the ticket question for the present, bearing in mind always that the system should be kept as simple as possible. To attempt to keep away from the ticket system altogether on a large interurban road is likely to put such burdens on the conductor that the simplicity sought for is not obtained. On the other hand, the reduction of everything to a ticket basis is likely to involve a more elaborate ticket system than is necessary in many cases. Say what we will about interurban railroading having got beyond the street car stage of development, there are many elements of the street car business in it yet, and these very elements are important factors in its success.

The principal objection urged against Mr. Norviel's paper at the Indiana convention was the hardship it would work on the passengers from country way platforms, who would be obliged to pay excess fare if they paid in cash, and would be obliged to go to some agent to have their cash-fare receipts redeemed by the company. The twenty-ride commutation ticket for rural passengers, suggested by Mr. Norviel as the way out of this difficulty, hardly overcomes the objection if the road gets any large percentage of its travel from points where there is no ticket agent. The necessity of buying a commutation ticket or of paying excess fare for cash-fare receipts which must be taken to a ticket office for a rebate is likely to be a deterrent from travel. There is the other side to it, however, that the possession of a commutation ticket induces travel, as a passenger will frequently ride on a commutation ticket in which he has already invested his money, where he would not take a ride if he had to pay cash fare outright.

To sum up briefly, the steam road ticket system relieves the conductors of much work and of many opportunities for mistakes or dishonesty. It introduces the complication and expense of maintaining a lot of ticket agents either on salary or commission and considerable money invested in tickets and forms, and also probably adds somewhat to the work of auditing. From the standpoint of the through passenger, it is a convenience, as it does away with the collection of fares by divisions, which would otherwise almost be a necessity on a large interurban system. From the standpoint of the short-distance passenger, it is mainly a nuisance.

As to Municipal Ownership

We do not desire to pose as prophets of evil, but it seems to us that the city of Chicago is up against the real thing. We have many times expressed ourselves feelingly as to the essential foolishness of municipal ownership under the conditions existing in American cities, but this particular case calls for more than usual fervor. We considered the general situation at some length last week, and our readers are therefore acquainted with the shuffling and indeterminate policy which has been displayed by the city in its attempt to get hold of the properties. Anyone who has ever followed the course of litigation in any municipal ownership case has a vivid idea of the probabilities in the Chicago rumpus. If the courts had any definite policy in dealing with the valuation of such properties when municipal ownership is under consideration, the outlook would be less dubious, but nearly every case of the sort has ended in a befogging compromise, leaving the fundamental issues obscured. But the phase of the matter which we are here considering is not its legal, but its physical and moral aspect. The grain of municipal ownership has been threshed over and over, and the raw material is still unchanged and unpalatable. We have heard the old arguments laid on fruitlessly again and again. It is perfectly true that certain municipal enterprises, particularly municipal waterworks, generally succeed well, both physically and financially. It is equally true that here and there other municipal enterprises have succeeded, but many more have failed dismally in economy. Municipal electric light plants in particular have an unsavory record of indifferent service and of disingenuous bookkeeping. There must be some general cause operating against success, else the results would have been better. What is it?

There are two things to be considered here, economy and operative efficiency. The citizens who pay taxes have a right to expect both in municipal service, however seldom they may get either. In certain cases, notably street cleaning, some city managements have been successful in one or the other, but never, to our knowledge, in both. Looking over the field broadly, it seems to us that the following principles explain many of the facts. In works demanding a relatively small working force a municipality can get efficiency, although not always economy. Where the personal element is large, efficiency can only be obtained at great cost, and sometimes not at all. In the waterworks, for instance, the number of employees is rather moderate, the permanent works constitute the chief source of expense, and while many cities find the service costly, it can be made effective. In the fire service, too, the force in the nature of things has to be carefully picked, and the very men themselves will not risk their lives by relying on incompetents. So on the whole, the department, while costly, is good. But the street department, where employees are very numerous and of low grade, is the natural home of graft, so that only by desperate efforts at reform can it be made even half decent. One might generalize a bit more and say that wherever there is in city employ a large mass of usable voters, just there the city sees the finish of both economy and efficiency. Strenuous efforts may keep part of the force straight all the time, and nearly all of it straight at rare and brief intervals, but that is about the limit of human endeavor. In enterprises like municipal lighting, success, when attained at all, has been in rather small places, where the entire working force was small enough to be easily watched. The moment one considers a large plant, things go wrong and it takes a quick eye to follow the saltatory double shuffles of items of expense through, under and over the city accounts.

Now, when a city, even with the best of intentions, undertakes to go into the street railway business, it meets disaster from the cause just named. The operating force of a big street railway system is of necessity large and composed entirely of adult males with votes. Their activities are distributed over a wide area, and Argus himself would have to be in about fifty places at once to keep track of them. The annual expenditures for material rise to enormous sums, and every item has an outer coating of potential commissions which even acute private management cannot always strip off. We are well aware that Chicago has recently been seized with an acute attack of municipal meningitis, but making a prognosis in the light of history there and elsewhere, we should hesitate to predict its becoming chronic. Given a municipal street railway system with its prodigious disbursements, thousands of employees and the socialistic bee buzzing busily, one would take no long chances in predicting an era better imagined than described. If we wished good service under such a delightful régime we should move into a doubtful ward. Of course, the long-haired doctrinaire points with complacency to the alleged results obtained in some foreign cities, but as we have just pointed out, the difficulty of working increases with the dimensions of the task, and even granting, which we do not, that even the best of the foreign municipal tramways is as cheaply and efficiently managed as it would be under judicious private management, we do not see the slightest hope of transferring that beatific condition of things to the Windy City, or to any city approximating it in size. The contracted area and meager requirements for rapid transit in most foreign cities furnish no basis of comparison with a city of skyscrapers flattening out into three counties of suburbs. Chicago is fearless, but this time Chicago has undertaken a job that rivals the labors of Hercules. In fact, we think the only chance of success would be to re-embody that muscular worthy and elect him general manager, with a brand new club and power to act. With Solomon as second vice-president and Aristides as general auditor there would be a fighting chance of developing a system that would not cause an exodus of everyone with anything worth stealing. No lesser aggregation of talent will make the thing go.

IMPROVEMENTS ON THE MOTOR CARS OF THE METROPOLITAN WEST SIDE ELEVATED RAILWAY COMPANY, CHICAGO

During the past year the Metropolitan West Side Elevated Railway Company, of Chicago, has made important improvements and additions to its rolling stock. A number of new motor cars have been purchased. The Westinghouse multiple-unit system of control has been used on these new cars, and in addition to this the same system of control has been put on all the other motor cars of the company. Along with this change, the new Westinghouse automatic air-brake system with graduated release has been put on all cars in place of the straight air-brake system formerly used. As all motor cars had to be rewired for the train-control system, a great deal of attention was given to making as perfect a job of wiring as possible. The bottoms of all motor cars were made fireproof wherever exposed to electric wires. New and heavier draw-bars have been put in and the floors of all cars raised 3 ins. to give more clearance between cars and trucks. The company has also had built an all-steel car, which was described in the STREET RAILWAY JOURNAL of Nov. 26, 1904. This car has been built as a sample, with the idea of making all future cars of the company of a similar construction.

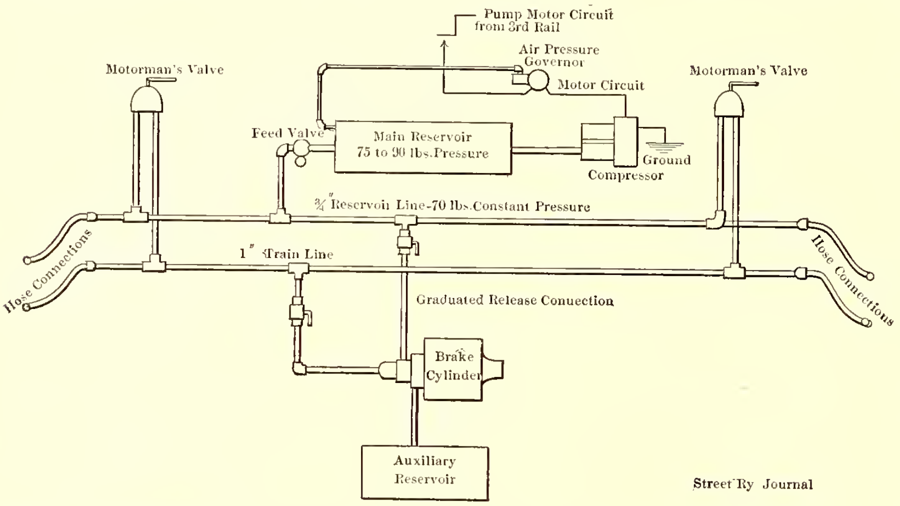


FIG. 1.—DIAGRAM OF APPARATUS UNDER ONE MOTOR CAR FOR AUTOMATIC BRAKE WITH GRADUATED RELEASE

There are seventy of the new motor cars with steel underframes and bottoms. Each is equipped with two motors on one truck, part of the motors being Westinghouse No. 109 and part GE 55. The company formerly had a number of motor cars equipped with four motors. In changing to the multiple-unit system, one pair of motors from these four-motor cars has been removed and placed on other cars, so that all motor cars now have but two motors each. The rolling stock of the company now comprises 166 motor cars, 186 trail coaches and 76 control coaches, which are not equipped with motors, but have a collapsible motorman's cab controller and air-brake apparatus, so that they can be used at the head of a train. Of course, all cars have been equipped with train control wires so that trains can be made up in any order, provided only that there is a car with the controller at the head of the train.

THE NEW AUTOMATIC AIR-BRAKE SYSTEM

Of the many interesting features in connection with this new work, one of the most interesting is the installation of the new Westinghouse automatic air-brake system with graduated release, this being the first use of this new system on a large commercial scale. The objection to the automatic air-brake system heretofore urged against its use on elevated trains has been the difficulty of controlling the brake-shoe pressure as accurately and quickly under all conditions as can be done with the straight air brake. This has led to the use of the straight air brake for elevated trains in some cases where an automatic air brake, on account of its greater safety, would be more desirable were it not for the greater ease with which the straight air brake can be controlled. The greatest objection to the Westinghouse automatic air brake as used on steam roads has been that, after the brakes were once applied, there was no way of reducing the brake-shoe pressure except by entirely releasing the brakes. If a motorman found he was running into a station with the brakes applied too hard so that he would stop short of the platform, he could not ease up on the brakes a little, as he could with the straight air brake, but had to release them fully and apply them again as hard as was necessary to stop the train. In doing this, he had to exercise considerable care, otherwise it meant a rough, jerking, uncomfortable stop from the passengers' standpoint, besides unnecessary wear and tear on the rolling stock and unnecessary consumption of air. If he did not apply the brakes very hard at first, he had to increase the brake-shoe pressure toward the end of the stop. But this is not a desirable method of making a stop, as brakes should be applied with the most pressure when the train is at the highest speed and the coefficient of friction between brake-shoes and wheels is the least. The brake-shoe pressure, to make the ideal stop, should be diminished as the speed falls off.

The new Westinghouse air-brake system with graduated release, as applied to the elevated cars of the Metropolitan West Side road, will consequently be of considerable interest to those acquainted with these difficulties in the past. The operation of the system is such that the manipulation of the motorman's valve is almost identically the same as if it were a straight air-brake system; the motorman can apply the brakes with any pressure from zero to maximum, can partially release this pressure, and can then either apply with greater pressure or release the brakes. Brake-shoe pressure can be increased and decreased without entirely releasing the brakes, and this can be continued an indefinite number of times, just as on a straight air-brake system. The system has all the advantages of the ordinary Westinghouse automatic air-brake system, in that the application of brakes is secured by a reduction of the air pressure in the train line pipe, so that, in case of leaks in the train line or the pulling apart of trains, the brakes will be automatically applied instead of leaving the train helpless and without brake power.

Fig. 1 shows diagrammatically the air-brake apparatus and piping on one motor car. There is a compressor driven by an electric motor pumping air directly into the main reservoir, which is 8 ft. 8 ins. long x 20 ins. in diameter. In this main reservoir a pressure of 75 lbs. to 90 lbs. per square inch is automatically maintained by a compressor governor connected with the main reservoir and the motor circuit. This governor is adjusted to start the compressor motor whenever the main reservoir pressure falls as low as 75 lbs., and to stop it whenever the pressure rises as high as 90 lbs. The main reservoir feeds into a ¾-in. reservoir line running the length of the train. Between the main reservoir and this reservoir line is a kind of reducing valve, called a feed valve, which acts to maintain 70 lbs. pressure in the reservoir line. This feed valve is so constructed as to act very quickly when once opened, so that if the pressure in the reservoir line falls below 70 lbs., the feed valve opens wide for an instant to restore the reservoir line pressure. In this way each

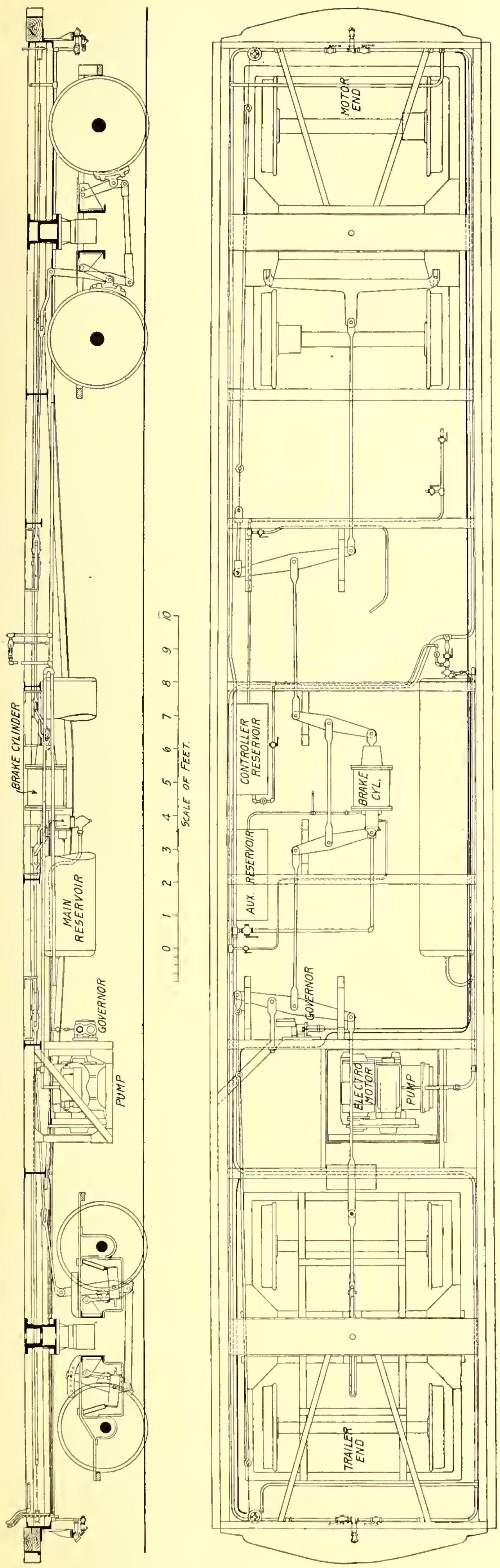


FIG. 2.—PLAN AND ELEVATION OF FLOOR FRAMING OF CAR, SHOWING BRAKE RIGGING AND PIPE LINES

compressor motor is made independent of the compressors on the other cars, as its action is dependent simply on the compressor governor controlled by its own main reservoir. The feed valves between each main reservoir and the reservoir line are relied upon to maintain a constant pressure in the reservoir line. There is no electrical connection between the compressor governors on the various cars.

Thus far we have considered only the supply of air to the reservoir line. We will now take up the working of the brake system proper. The reservoir line has pipes leading to the motorman's valves at each end of the car. In addition to the reservoir line, which is maintained at 70 lbs. pressure, there is the usual train line of 1-in. pipe running the entire length of the train. When the motorman's valve is in release position, the reservoir line is connected through the motorman's valve to the train line, thus maintaining the train line also at 70 lbs. pressure. Under each car is the usual brake cylinder and auxiliary air reservoir. Mounted on the brake cylinder is an automatic triple valve, which in many respects is similar to the ordinary triple valve used on Westinghouse automatic air brakes, but which has certain features which make it possible to secure a graduated release of the brakes. As most of the readers of this article are probably familiar in a general way with the action of the ordinary Westinghouse triple valve, it will not be necessary to go into full details as to the action of this valve, but a general idea of the results it accomplishes will first be given, in order that the graduated release explained later may be better understood. In the Metropolitan Elevated equipment there is a graduated release connection from the triple valve to the reservoir line on all cars, but we will suppose at first that this graduated release connection is omitted, in which case the brakes would be like the Westinghouse ordinary air brakes. With the ordinary brakes, when the brakes are released, the motorman's valve is in a position which allows air to pass freely from the reservoir line into the train line. From the train line, connections are open so that air passes directly through the triple valve into the auxiliary reservoir, thus maintaining the auxiliary reservoir at train line pressure as long as the brakes are released. To make a service application of the brakes, the motorman's valve is turned so that the opening to the reservoir line is closed and a small opening is established through which a portion of the pressure in the train line is allowed to escape gradually to the atmosphere. This reduction of train line pressure operates the triple-valve piston and slide valve so as to open a small passage from the auxiliary reservoir to the brake cylinder, which passage is closed when the pressure reduction in the auxiliary reservoir is greater than that in the train line. To release the brakes, the motorman, in turning his valve to release position, opens the passage in his valve from the reservoir line to the train line as before. The restoration of train line pressure in the triple valve causes it to move to a position which restores the opening from the train line into the auxiliary reservoir as before, and at the same time opens a passage from the brake cylinder to the atmosphere so as to allow the air in the brake cylinder to escape and release the brakes. A full service application of the brakes is accomplished when the auxiliary reservoir pressure is permitted to equalize with the brake cylinder, this being caused by a train line reduction of about 20 lbs. A smaller reduction in train line pressure will give a correspondingly smaller auxiliary reservoir reduction and a lower brake-cylinder pressure, for the reason that as soon as the auxiliary reservoir pressure (which acts against one side of the triple-valve piston) is reduced very slightly below the pressure in the train line (which acts on the other side of the triple-valve piston), the valve which controls the flow of air from the auxiliary reservoir to the brake cylinder moves to the lap or closed position. The application of brakes can therefore be graduated to any point desired.

To make possible a graduated release, a connection is made from the reservoir line to the triple valve, as indicated in Fig. 1, and a triple valve is employed which differs from the ordinary triple valve. The cycle of operations for a brake with graduated release is as follows: With a motorman's valve at release position there is a connection through the motorman's valve between the reservoir line and train line as in the other brake, and the train line, in turn, is open through the triple valve to the auxiliary reservoir. There is also a passage open

FIG. 3.—NEW MOTOR CARS OF METROPOLITAN ELEVATED, SHOWING NO PLATFORM FEATURE AND AIR-COOLING COILS ON SIDE SILLS

from the reservoir line by way of the graduated release connection, through the triple valve, to the auxiliary reservoir. When the brakes are to be applied in a service application, the motorman's valve, as in the other brake, closes the connection between the reservoir line and train line and allows the train line pressure to escape gradually until the desired reduction is obtained. When the train line pressure is reduced below that in the auxiliary reservoir, the triple-valve piston is moved to the application position in the ordinary manner. The first movement of the triple valve closes the graduated release connection so that no air can flow into the auxiliary reservoir from that source, closes the passage between the auxiliary reservoir and the train line and opens a passage from the auxiliary reservoir to the brake cylinder. This movement of the triple valve also opens a port, which causes the train line to vent into the empty brake cylinder until such time as the motorman ceases to let air escape from the train line. This assists the motorman's valve in quickly reducing the train line pressure for the full length of the train, and so causes the prompt application of the brakes for the full length of the train. It also means that a greater pressure can be obtained in the brake cylinder with a given amount of air drawn from the auxiliary reservoir because of the amount of air that is drawn from the train pipe, which would otherwise be discharged to the atmosphere and wasted. This practically means that 10 per cent higher brake pressure is obtained with a full service application than with the ordinary automatic air brake, and in lighter applications the saving is considerably more than this, because the construction of the valve is such that with light applications a large percentage of the air required in the brake cylinder comes from the train pipe.

We come now to the graduated release action. To partially release the brakes, the motorman moves his valve so as to partially restore the normal pressure in the train line. The piston which operates the slides in the triple valve, and which does the mechanical work of opening and closing the various ports in the triple valve, is arranged so that on one side of it there exists the auxiliary reservoir pressure, whatever that may be, and on the other side the train line pressure. The restoration of pressure in the train line so as to exceed the auxiliary reservoir pressure, as in the ordinary automatic air brake, causes the piston to move over so as to discharge the pressure in the brake cylinder to the atmosphere. In the graduated release brake, however, the movement of the triple-valve piston in the direction of release also opens the graduated release connection from the reservoir line into the auxiliary reservoir. The opening of this graduated release connection immediately tends to restore the auxiliary reservoir pressure to normal. What actually takes place is that the auxiliary reservoir pressure is raised until it slightly overbalances the pressure in the train line, and the train line pressure, it will be remembered, has been only partially restored. As soon as the auxiliary reservoir pressure exceeds that in the train line, it moves the triple-valve piston back a little so as to stop the escape of air from the brake cylinder, and also stops the flow of air through the graduated release connection to the auxiliary reservoir. Should it be desired to let more air out of the brake cylinder, so as to release the brake still more, it is only necessary to repeat the operation of raising the train line pressure. The triple valve then lets more air escape from the brake cylinder, air flows momentarily through the graduated release connection to the auxiliary reservoir, and the auxiliary reservoir pressure moves the triple valve back again after having released a little more air from the brake cylinder. The system has been so well worked out that its action, as said before, is almost like that of a straight air brake, as far as the motorman's valve and brake-cylinder pressures are concerned.

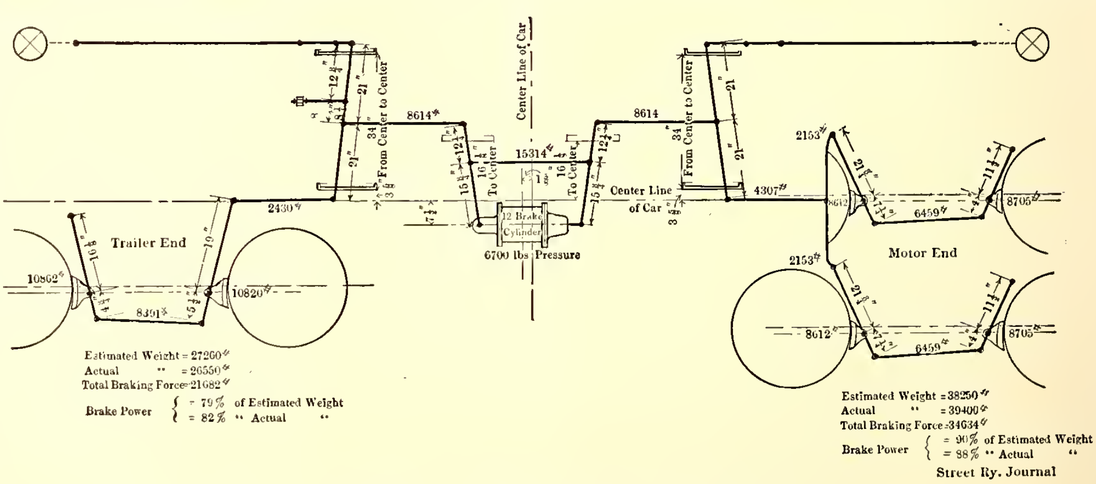


FIG. 4.—DIAGRAM OF BRAKE RIGGING OF MOTOR CARS

The recharging of the auxiliary reservoir from the reservoir line when the brakes are released is manifestly done both through the graduated release connection and through the connection afforded by the motorman's valve by way of the train line and triple valve to the auxiliary reservoir. Most of the recharging of the auxiliary reservoir will evidently be done through the graduated release connection, because that connection is much more direct than the path offered through the motorman's valve and the train line, the motorman's valve being what applications may have been made immediately before, or to what extent the brake-cylinder pressure has been discharged during release.

In previous applications of the automatic air brake to multiple-unit trains, it was necessary to run a high-pressure pipe line through the train to equalize the pressure in the main

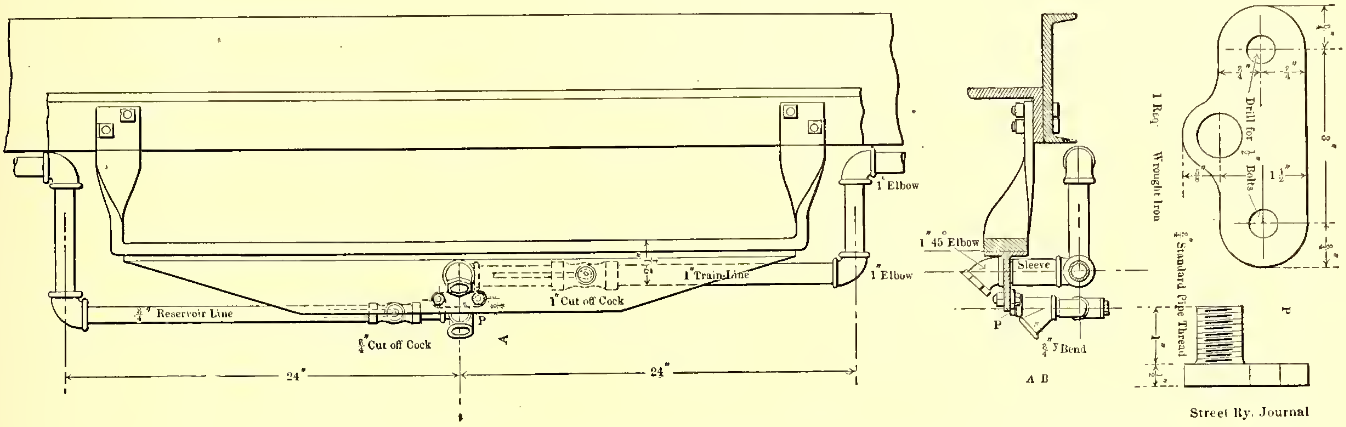


FIG. 5.—SECTOR-BAR AND HOSE CONNECTIONS

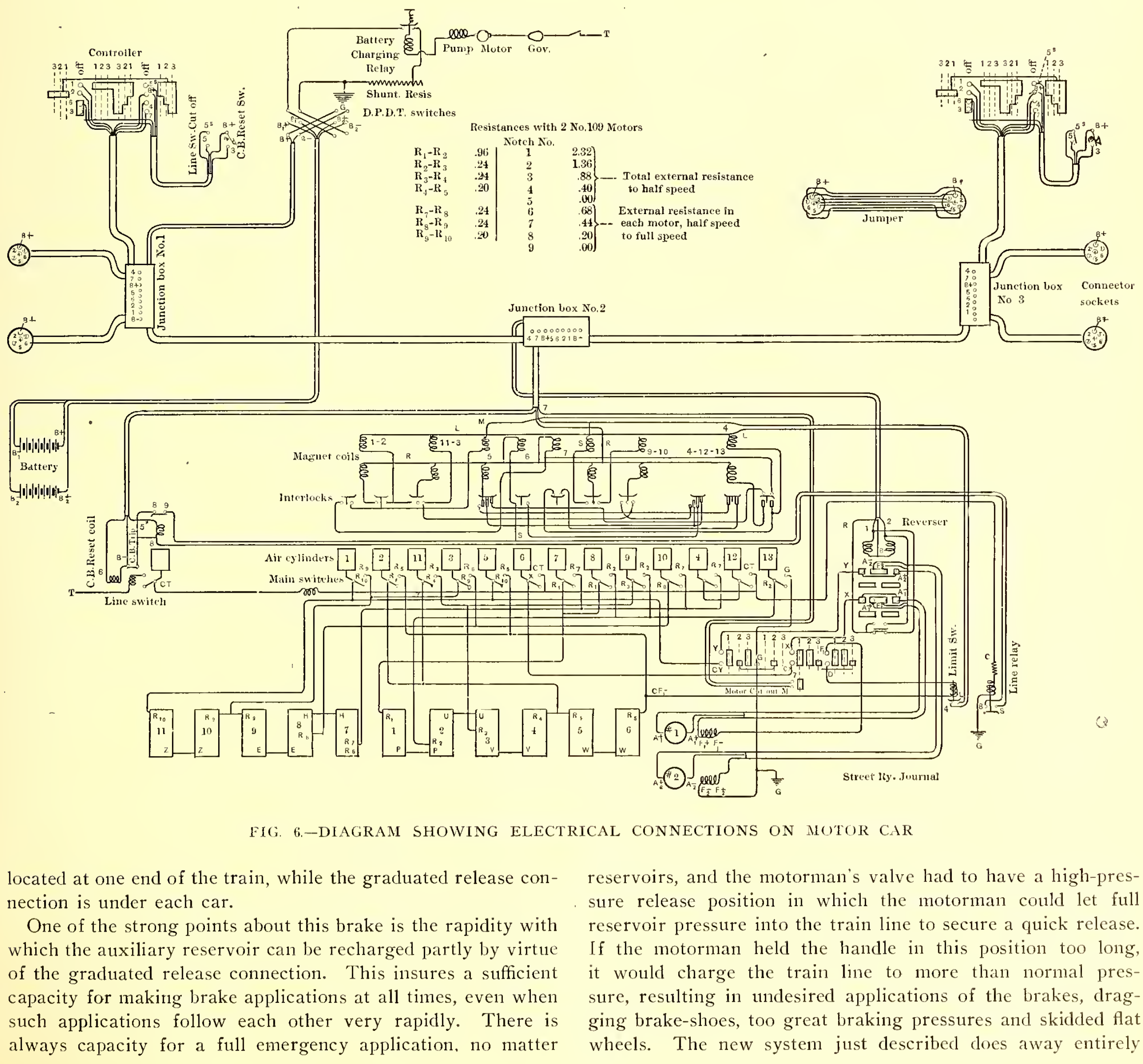


FIG. 6.—DIAGRAM SHOWING ELECTRICAL CONNECTIONS ON MOTOR CAR

located at one end of the train, while the graduated release connection is under each car.

One of the strong points about this brake is the rapidity with which the auxiliary reservoir can be recharged partly by virtue of the graduated release connection. This insures a sufficient capacity for making brake applications at all times, even when such applications follow each other very rapidly. There is always capacity for a full emergency application, no matter reservoirs, and the motorman's valve had to have a high-pressure release position in which the motorman could let full reservoir pressure into the train line to secure a quick release. If the motorman held the handle in this position too long, it would charge the train line to more than normal pressure, resulting in undesired applications of the brakes, dragging brake-shoes, too great braking pressures and skidded flat wheels. The new system just described does away entirely with all of these difficulties, as there is no high-pressure equalizing line between main reservoirs and no high-pressure connection with the motorman's brake valves.

AIR-BRAKE PIPING AND LEVERS

Fig. 2 shows the brake rigging and pipe lines as actually installed under a car in plan and elevation. This gives the exact location and size of pipes, reservoirs and other apparatus. It will be noticed that the feed valve is located under a seat inside the car, for the double reason of placing it high where moisture will not interfere with it and placing it where it is not likely to be frozen up, for, like all reducing valves in use for handling compressed gasses, considerable heat is absorbed by the expansion of the air at this point, which results in a low temperature at the valve and some precipitation of moisture from the air. Another interesting feature of the air-brake equipment is the cooling coils, one of which can be seen located on the side of the girder which forms the side sill of the car shown in Fig. 3. The object of these cooling coils is to reduce the air to atmospheric temperature before it reaches the feed valve, and also while it is on its way from the pump to the main reservoir. And here is an interesting bit of air-brake experience which is worth knowing. It would be supposed that an elevated car would have sufficient air circulating underneath when in operation so that there would be no difficulty about cooling the air down into atmospheric temperature by pipes placed under the car. Both the old and the new cars of the Metropolitan Elevated road, however, are peculiar in construction, in that they have steel girders or I-beams for side sills. The new cars, one of which is shown in Fig. 3, is especially noticeable in this respect, and it is found that the protection afforded by these side sills made it impossible to secure ordinary atmospheric temperature under the car, as it was invariably several degrees above atmospheric temperature. No amount of cooling coils placed under the car would suffice under such conditions. The only remedy was to place cooling coils out where they could get a free circulation of air, and this was done by hanging them just outside the steel side sills, as seen in Fig. 3. Fig. 4 shows in diagram the dimensions of the brake levers and brake-shoe pressures. It will be noticed that on the trailer truck, which has no motors, the brake-shoe pressure is 82 per cent of the actual weight of the car, while on the motor end it is 88 per cent of the actual weight of the car. In the original calculations 10 per cent extra pressure was allowed on the motor truck on account of the momentum of the armatures.

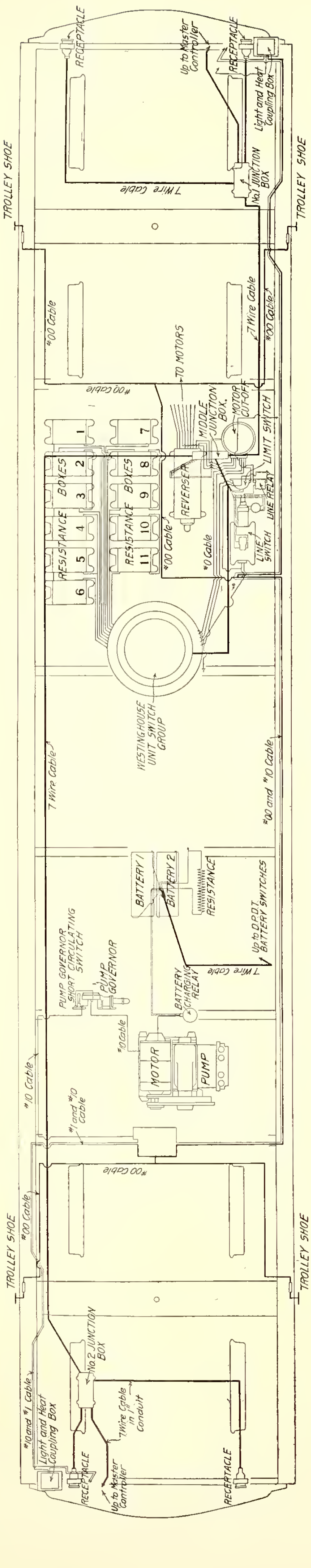


FIG. 7.—PLAN OF CAR WIRING, SHOWING LOCATIONS OF CONDUITS AND ELECTRICAL APPARATUS

A neat arrangement of hose connections is shown in Fig. 5. Both the ¾-in. reservoir line and the 1-in. train line terminate in fittings which fasten to the T-iron which supports the draw-bar. The train line is attached just above the reservoir line.

TRAIN-CONTROL SYSTEM

The Westinghouse electro - pneumatic system of train control has been installed on all the motor cars. Besides this, controllers have been placed on seventy-six control coaches which do not have motors, as before noted.

When the original Westinghouse electro - pneumatic system of train control, with group switches under each motor car and low-voltage electric control circuits between the cars, was first placed on the market in 1903, it was termed

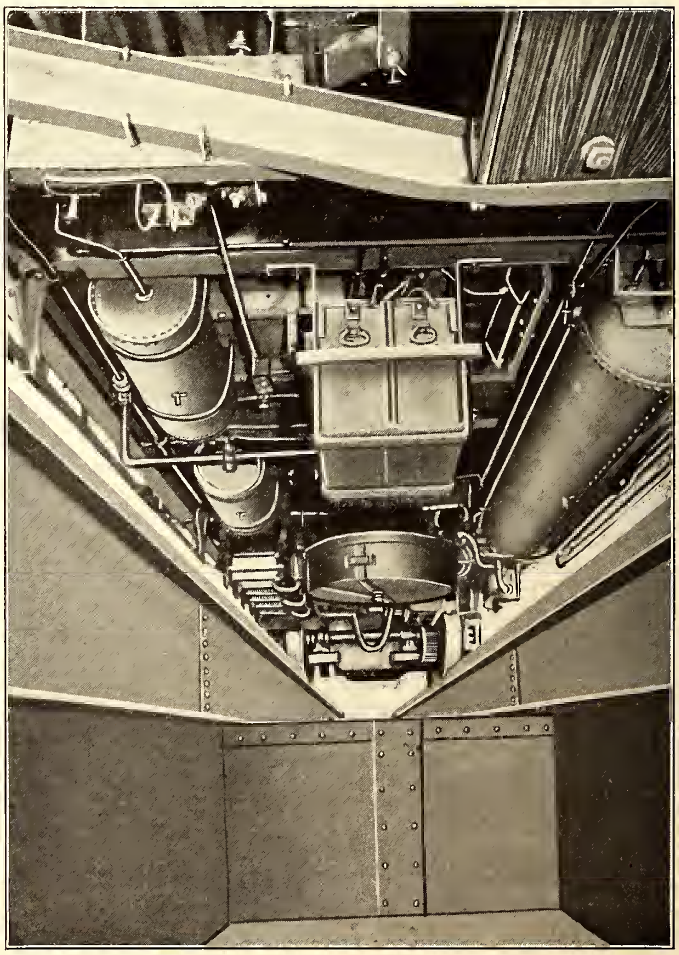


FIG. 8.—VIEW UNDER METROPOLITAN ELEVATED CAR

the turret control, on account of the supposed resemblance of the cover of the switch group to a turret. This system was described in the Street Railway Journal for Sept. 26, 1903. A number of important changes have been made in the system, however, which, in its latest form, is now in use on the Metropolitan West Side cars and in Brooklyn. Thus, the shaft on the master controller is horizontal instead of vertical, as in the earlier controller, and the plan of electrically interlocking the master controller with the air brakes has not been retained. There have also been modifications in the form of the unit switches. As it is proposed to describe the Brooklyn system in the issue of May 6, further details will be omitted in this connection, except to present a diagram of the connections. This is done in Fig. 6.

WIRING AND FIREPROOFING OF MOTOR CARS

The Metropolitan Company has given much attention in the last few years to precautions against fire, and the wiring of its new motor cars, as well as the rewiring of the old motor cars, constitute some of the finest pieces of car wiring to be found in the country. The general plan of wiring has been to run wires under the car in loricated iron-pipe conduit. The rule has been to have no 500-volt current above the car floor, except that used on the lighting circuit; even the main circuit breaker being underneath the car and set and tripped by a 14-volt battery circuit, as previously noted. The lighting circuits are laid in iron-pipe conduit up to the distributing board, where the fusible cut-outs are located. The electric heating circuits are also placed in iron pipe above the floor. All the wire used has flameproof Simplex insulation.

Fig. 7 is a plan of the wiring under the car floor, indicating the location of wires and conduits. Figs. 8 and 9 are views taken underneath the car, showing the general character of the work. In Fig. 9 the resistance grids are shown at the right and the reverser at the left. The eight wires leading from the motors to the reverser are seen at the left-hand top in Fig. 9. These wires also show another recently adopted practice of the company, namely, that of using motor leads covered with spiral brass wire for protection against abrasion. From the third-rail shoes the main leads are carried under the truck frame in a wooden molding. The truck frame can be seen at the top of Fig. 9, with the main wire leading out from under the frame and entering the reverser. In Fig. 8 the air-brake storage cylinders are in the right and left foreground, and the storage battery tray in the middle. In a few places it is necessary to cleat wires against boards hung some distance below the car floor. These wood cleats, boards and molding are painted with fireproof paint.

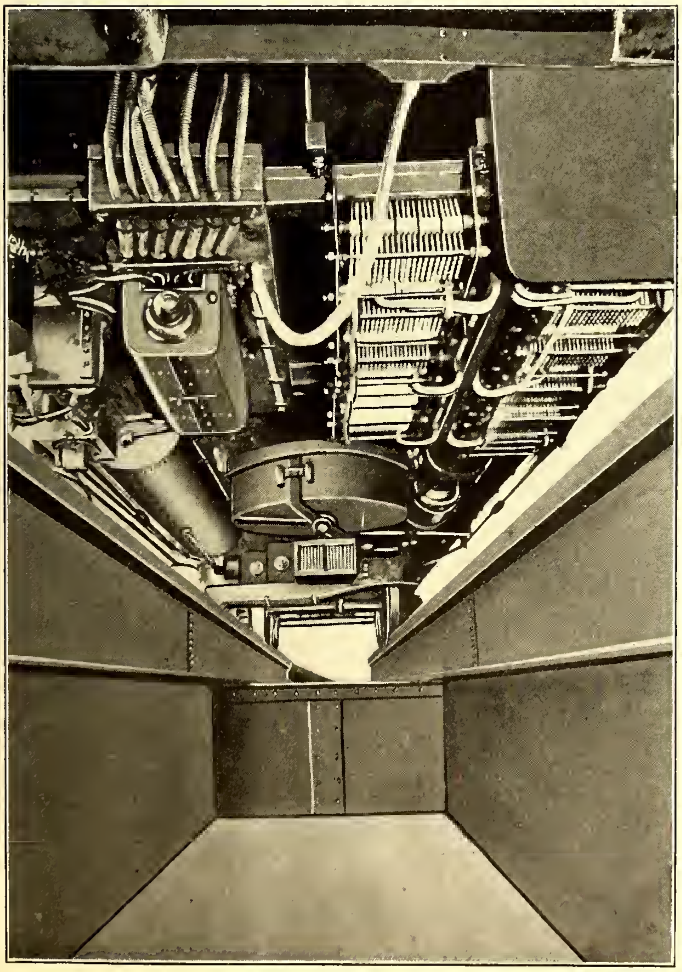


FIG. 9.—VIEW UNDER METROPOLITAN ELEVATED CAR

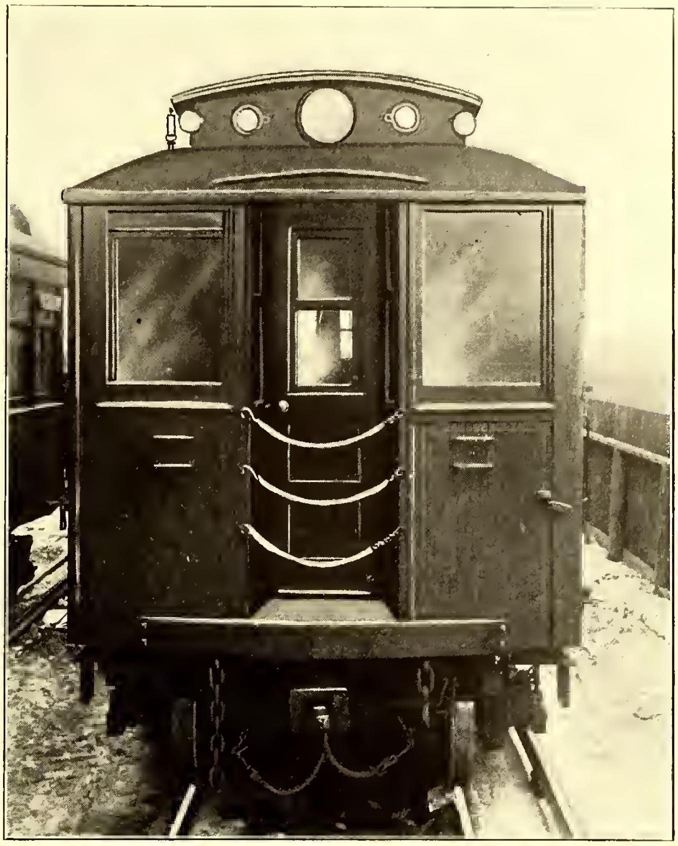


FIG. 10.—END VIEW OF NEW MOTOR CAR, SHOWING GUARD'S NICHE AND DOOR

The real fireproofing of the car consists, in the new cars, of a continuous sheet of steel under the entire car floor, so that it is practically impossible for fire starting in the wiring under the car to set fire to the car floor. On the old cars, sheets of steel 1/8 in. in thickness have been placed over the wiring under the car floor. Between the steel and the car floor is asbestos board 1/4 in. thick.

The management believes strongly in steel as a fireproofing material in places exposed to grease under the car as against any fireproof materials that will absorb oil. It is believed that the use of very absorbant fireproofing materials would give rise to serious trouble in places exposed to oil, as the oil would burn out of them just as out of an asbestos wick. Furthermore, it is possible to scrape the grease off clean from steel sheeting, while it would be impossible to do so with softer material.

CAR BODIES

Fig. 3 is an exterior view of one of the new motor cars. This type of car, however, is to be regarded rather as a transitional type than as the standard adopted by the road, because the idea is to build steel cars something after the plans of the one which is just being completed, which was described in the Street Railway Journal of Nov. 26, 1904.

The special feature of the cars now used by this company is the end door arrangement, which does away entirely with the

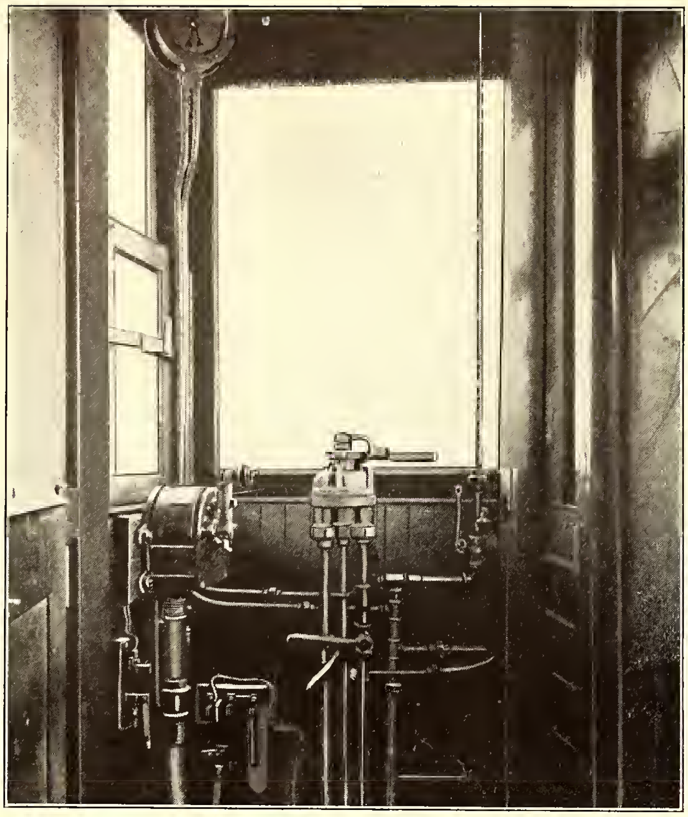


FIG 11.—MOTORMAN'S CAB INTERIOR, WITH AIR BRAKE AND CONTROL APPARATUS

usual platform. While the management realizes that side door cars of the Illinois Central type have their advantages where they can be used, it is not possible to use them on this road, because only the front platform of the rear car of a train comes

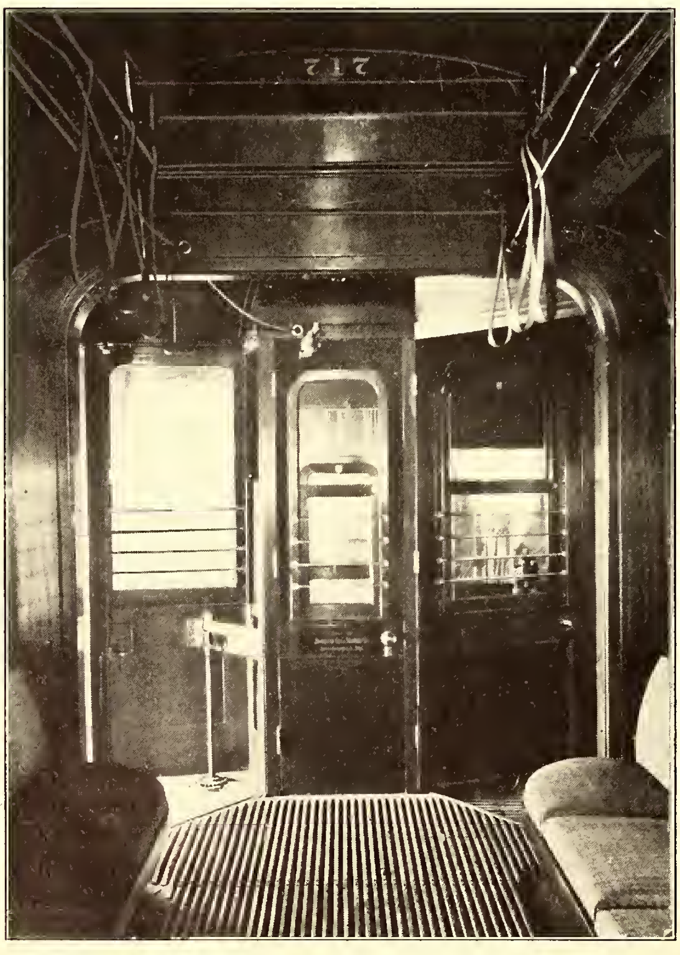


FIG. 12.—INTERIOR OF CAR END WHEN NOT AT HEAD OF TRAIN

up to a station platform when full length trains are run. The end view of this type of car is shown in Fig. 10. It will be seen that there is a niche for the guard in which he can stand and open the doors without entering the car. The doors are opened by compressed air, and the levers controlling the pneumatic door openers are just above the head of the guard. In Fig. 16 is a side view of the end of the car with a guard in the act of opening a door; in Fig. 17 the door is shown open. It can easily be imagined that passengers load and unload from this car more quickly than from the ordinary car, where they must first go on to a platform. The route from the interior of the car to the station platform is much more direct than on the old-fashioned type of car. There is the further advantage that on one of these cars the guard does not need to open a big door in cold weather in calling the name of the station. The guard's

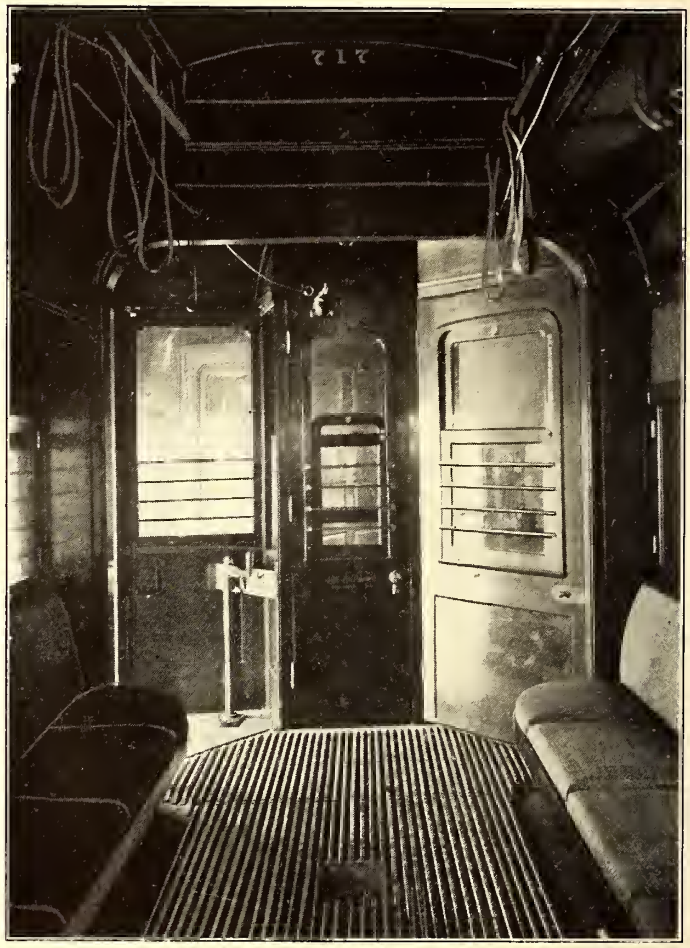


FIG. 13.—CAR END, WITH MOTORMAN'S CAB IN USE

door is narrow and equipped with an automatic door closer. To simply call the name of a station, the guard does not even have to enter a car, as he can open the window in the door. Taken altogether, the new arrangement avoids a lot of opening and closing of the car to the great discomfort of passengers in extremely cold weather. The guard has instant control of both doors from one point, and it is not necessary, as in the old-fashioned car, for him to open first one large door and then the other when running into a station and keep them open until after he has closed the platform gates. The doors, which also serve the purpose of platform gates, are kept closed until the train has come to a full stop, when they are fully opened at once and the passengers file out. The pneumatic door opener consists of a long cylinder and piston concealed behind the advertising rack at the end of the car, as shown in Fig. 15. When the door is near the end of its travel in closing, it encounters a dash pot, which makes it travel the last few inches slowly to avoid the danger of catching the fingers of passengers not acquainted with the device. In Fig. 12 is shown the interior of the end of one of these cars as it would be arranged when not at the head of a train. The door at the right swings around so as to protect the controlling apparatus. Passengers can be discharged from either side of the car. In Fig. 13 is shown the interior of the end of the car as it would be used if at the head of a train. The door at the right has been swung around at an angle so as to form a motorman's cab. It is also shown in the plan of the motorman's cab in Fig. 14. Fig. 11 is from a photo-

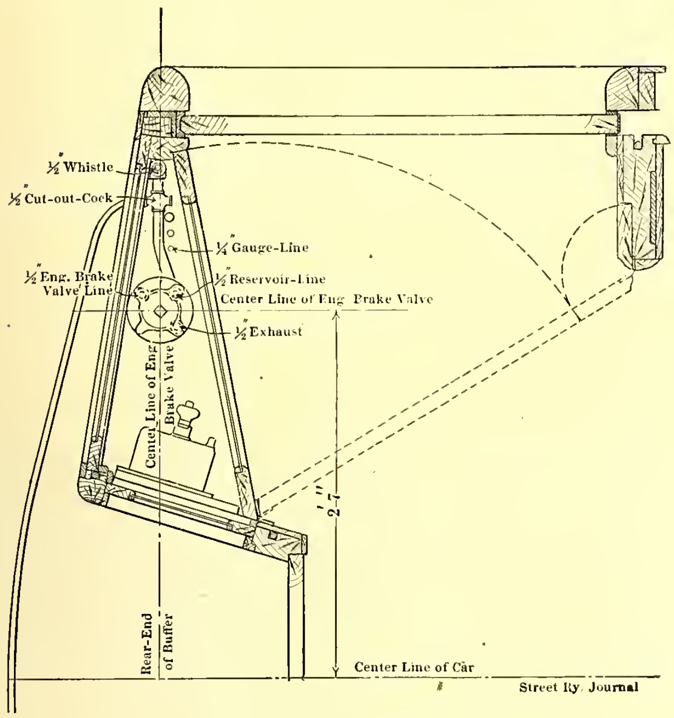


FIG. 14.—PLAN OF MOTORMAN'S CAB

graph of the interior of the motorman's cab showing the controlling apparatus. In this it will be seen that the electric controller is placed against the left wall of the cab so that the motion of the controller handle is forward and back, corresponding with the direction of train movement.

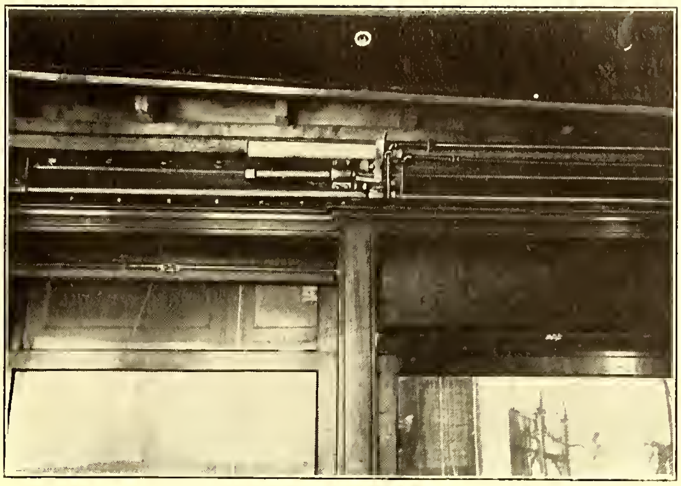


FIG. 15.—PNEUMATIC DOOR OPENER BEHIND "AD" RACK

As before mentioned, seventy-six trail coaches have been equipped with motormen's cabs. These cabs are convertible, and when not in use for the motorman are utilized for two regular passenger seats. The coaches so equipped with cabs are of the regular old style, with open platforms at each end. Fig. 19 shows the motorman's cab in use, and Fig. 18 shows the door of the cab folded around against the controlling apparatus at the end of the car and a seat let down which can accommodate two passengers. The partition which forms the back of the motorman's cab remains permanently in position. To convert from a passenger compartment to a motorman's cab, the seat is folded up against this partition and the door which protects the controlling apparatus is swung back to form a side door to the cab. The seat for the motorman pulls out from the bottom of the folded up passenger seat. A similar arrangement has been used on some of the older motor cars of this company, and originated on this road. Its advantages are that it leaves an entirely open platform on both sides of the car and allows the motorman's cab space to be used for passengers when not at the head of a train. The past winter the company has had on its Garfield Park line forty-five Peter Smith hot-water heaters and twenty-three Franklin hot-water heaters with internal

FIG. 16.—END OF CAR, GUARD READY TO OPEN DOOR WITH AIR VALVE

FIG. 17.—DOOR OPEN, A QUICK-LOADING CAR

FIG. 18.—CONVERTIBLE COACH CAB ARRANGED FOR PASSENGERS

coils and surrounded with a water-jacket. Some of these have been located near one end of the car and others are shown in Fig. 20. The results as regards keeping cars warm and comfortable have been very satisfactory, the large amount of hot water in the pipes offering a large heat storage and radiating capacity for use in quickly bringing up the temperature after doors have been opened at stations. These heaters have all been installed under guarantees to maintain the cars at a comfortable temperature with 100 lbs. of hard coal per day.

A regular routine has been established for the care and maintenance of these heaters on the sixty-eight cars so equipped.

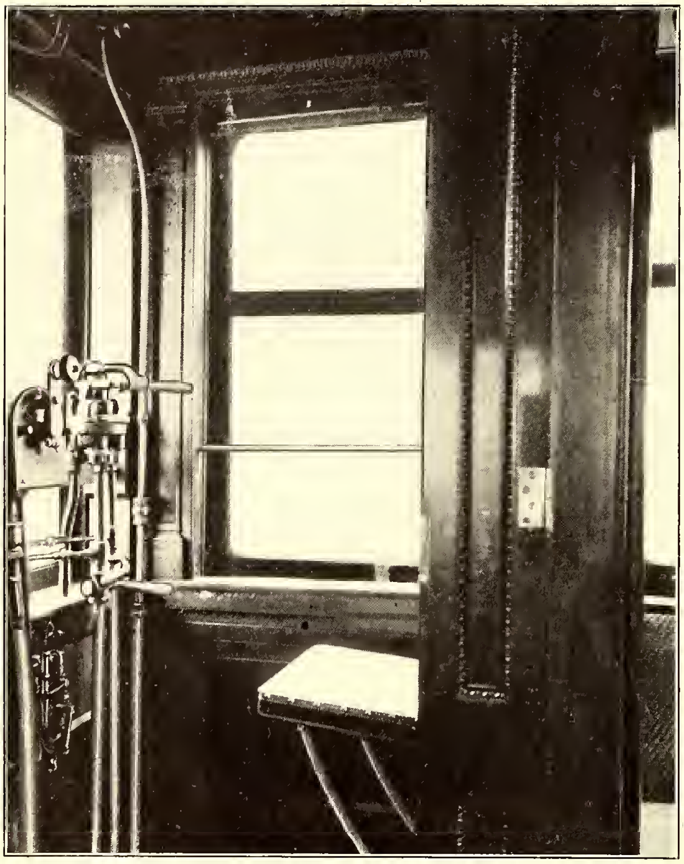


FIG. 19.—CONVERTIBLE COACH CAB ARRANGED FOR MOTORMAN

Conductors and guards have nothing whatever to do with the care of the heaters. When the cars are in operation they are taken care of by a man who is kept on duty constantly at the platform of the outer terminal station. His duty is simply to keep the fires going and give the heaters what little attention they may need between trips. The main work of taking out ashes, putting in coal, building fires and the like is done by the yard men, two on duty in the day time and four at night. The fires are kept up constantly, as, of course, it would not do to let the temperature get down to freezing point during the night, and it would furthermore be difficult to get the cars to a comfortable temperature for the first trip in the morning, on which of all trips they should be thoroughly warm. So comfortable were the cars kept in extremely cold weather that it was the opinion of the management that had all the cars of the company been equipped with these heaters at that time, the road could not have handled all the traffic that would have come to it during that weather when it was practically impossible to keep surface cars at a comfortable temperature with the ordinary facilities provided.

In making all these changes in rolling stock, the shops of the company, under the management of E. T. Munger, master mechanic, have shown themselves of remarkably high efficiency. Just before making these changes, important improvements were made in the shop equipment. This part of the subject will therefore be taken up in a separate article.

SNOW STATISTICS FROM BOSTON

The following detailed statistics show the comparative costs of handling snow on the 445 miles of surface lines operated by the Boston Elevated Railway Company for the winters of 1903-04 and 1904-05. The termination of the winter permits a comparison with last year. As will be seen, there has been a decrease in all items, showing that in Boston, unlike New York, the past winter was less severe than a year ago. The New York figures and those for some other cities were published in the STREET RAILWAY JOURNAL for March 18:

	1903-4	1904-5	Decrease
Number of snow storms recorded....	16	12	4
Number of plows used*	3,238	2,303	935
Mileage of plows	133,437	104,627	28,810
Wages on plows	$30,786	$23,075	$7,711
Wages on levelers	1,361	924	437
Wages extra snow labor	86,307	50,925	35,382
Wages road department, snow labor..	36,742	18,873	17,869
Expense for hired teams............	69,815	47,716	22,099
Miscellaneous expense	3,511	2,628	883
Total	$228,521	$144,141	$84,380
Number of company's horses.........	3,102	1,953	1,149

* Obtained by adding together the number of plows used during each storm.

FIG. 20.—GENERAL CAR INTERIOR AND HOT-WATER HEATER

The following shows the cost for carting snow, excluding all other expenses:

	1903-4	1904-5	Decrease
Number of loads carted	238,672	185,056	56,613
Expense of teams	$70,072	$47,689	$22,383
Expense of men	75,020	37,888	37,132
Total expense	$145,093	$85,578	$59,515
Cost per load	$.61	$.46	$.15

The Toledo, Bowling Green & Southern Traction Company has recently instituted a freight service on its line and it is going after the business of fruit and produce farmers. Sidings have been located at convenient points along the line and the company is advertising special rates on carload lots of produce.

MASTER MECHANICS' REPORTS AT SCHENECTADY

The mechanical department of the Schenectady Railway Company uses two sets of report sheets which are believed to be particularly worthy of study. The forms are reproduced in Fig. 1, A and B, and Fig. 2.

The Schenectady Railway Company has adopted (with some modifications) the standard system of classification of accounts recommended by the Street Railway Accountants' Association of America, and the blanks are prepared to conform with this system. For the purposes of the various departments, however, it was considered desirable to subdivide the account numbers as given in the Accountants' Association recommendations, in order to facilitate the examination of the minute details that go to make up the different accounts. Accordingly, the system of designating accounts was enlarged so as to give a separate number (known as the working order number) to the several items listed under the various account numbers. The same system of numbering was also made to include various special items peculiar to the local conditions at Schenectady. The scheme of notation as worked out for the master mechanic's department will be understood from the schedule reproduced herewith. For instance, various items under account 9 were called 90, 91, 92, etc.; if it was desired to add new items between 90 and 91, they were called 090, 091, etc., and if still more items were to be added at this point, they were called 0090, 0091, etc. Of course, the system affords means for subdividing indefinitely. In the schedule, "R" indicates Railway department; "M," Maintenance; "T," Transportation; "P," Property, etc. One incidental advantage of this system of numbering is that the number itself indicates the particular car house or division by which the item was used.

The schedule for the mechanical department is set in type and printed copies are pasted on heavy cardboard. (A coat of light shellac is spread over the face of the schedule to preserve the paper.) Copies of the schedule prepared in this way are distributed throughout the department, where they can be consulted readily by all who have to do with this particular set of working numbers. Working order numbers, as shown in the schedule, are used freely for reference purposes by the office

SCHEDULE OF REPAIR ACCOUNTS USED BY SCHENECTADY RAILWAY

REPAIRS OF BUILDINGS

R 30 M—Account No. R-3-M. Labor and material for maintenance of Fuller Street barn.
R 32 M—Account No. R-3-M. Labor and material for maintenance of building No. 420 State Street.
R 33 M—Account No. R-3-M. Maintenance of Albany sub-station building.
R 34 M—Account No. R-3-M. Maintenance of Troy sub-station building.
R 35 M—Account No. R-3-M. Labor and material in maintenance of McClellan Street barn.
R 36 M—Account No. R-3-M. Maintenance of Dock Street power house [building only].
R 37 M—Account No. R-3-M. Labor and material maintaining building at 438 State Street.

REPAIRS OF AIR COMPRESSORS

R 098 M—Account No. R-9-M. Labor and material for maintenance of air compressor, McClellan Street barn.
R 099 M—Account No. R-9-M. Labor and material for maintenance of air compressor, Fuller Street barn.
R 0090 M—Account No. R-9-M. Labor and material for maintenance of air compressor, Albany sub-station.
R 0091 M—Account No. R-9-M. Labor and material for maintenance of air compressor, Troy sub-station.
R 0092 M—Account No. R. Labor and material operating and maintaining air compressor at 420 State Street.

REPAIRS OF MECHANICAL EQUIPMENT

R 90 M—Account No. R-9-M. For labor and material in repairing fenders.
R 91 M—Account No. R-9-M. For labor and material in painting car bodies, repairs and renewals.
R 92 M—Account No. R-9-M. For labor and material in repairing car bodies, carpenter work.
R 93 M—Account No. R-9-M. For labor and material in repairing registers.
R 94 M—Account No. R-9-M. For labor and material in repairing air-brake equipment.
R 95 M—Account No. R-9-M. For labor and material in repairing car signs.
R 96 M—Account No. R-9-M. For labor and material in repairing trucks, time of blacksmith and helper, also cost of coal.
R 97 M—Account No. R-9-M. For labor and material in repairing snow scrapers on cars.
R 98 M—Account No. R-9-M. For labor and material in repairing emergency brakes.
R 99 M—Account No. R-9-M. For labor inspecting trucks.
R 090 M—Account No. R-9-M. For labor and material in repairing express cars.
R 091 M—Account No. R-9-M. For labor and material in repairing sand boxes.
R 092 M—Account No. R-9-M. For labor and material in repair of electric heaters.
R 093 M—Account No. R-9-M. Labor and material in repair of electric headlights.
R 094 M—Account No. R-9-M. For labor and material required in shifting trucks from winter to summer cars and vice versa.
R 095 M—Account No. R-9-M. Labor and material repairing trucks which have been damaged in accidents.
R 096 M—Account No. R-9-M. Labor and material repairing car bodies which have been damaged in accidents.
R 097 M—Account No. R-9-M. Labor and material turning down flat wheels.
R 120 M—Account No. R-12-M. For labor and material in repairing snow plows.
R 122 M—Account No. R-12-M. For labor and material in repairing sprinkler.
R 130 M—Account No. R-13-M. For labor and material in repairing shop tools and machinery.
R 924 P—Repairs to mechanical equipment, motor flats.
R 0093 M—Repairs to hot-water heaters.

REPAIRS OF ELECTRICAL EQUIPMENT

R 100 M—Account No. R-10-M. For labor and material in repairing railway motors.
R 101 M—Account No. R-10-M. For labor and material in repairing car wiring.
R 102 M—Account No. R-10-M. For labor and material in the repair of C-8 controllers.
R 103 M—Account No. R-10-M. For labor and material in repairing Type-K controllers.
R 104 M—Account No. R-10-M. For labor and material in repairing contactors, reversing switches and cut-outs.
R 105 M—Account No. R-10-M. For labor and material in the repair of trolley poles.
R 106 M—Account No. R-10-M. For labor and material in repair of railway armatures.
R 109 M—Account No. R-10-M. For labor and material in repair of electrical equipment on express cars.
R 0102 M—Account No. R-10-M. For labor and material in repairing armature lining.
R 0103 M—Account No. R-10-M. For labor and material required in shifting electric equipment from winter to summer cars, and vice versa.
R 0104 M—Account No. R-10-M. Labor and material repairing electrical equipment of cars damaged in accidents.
R 923 P—Repairs to electrical equipment, motor flats.

MAINTENANCE OF CARS

R 25 T—Labor, switchman's time.
R 27 T—All lubricants for cars.
R 260 T—Account No. R-26-T. Labor for cleaning lamps, lanterns and headlights.
R 261 T—Account No. R-26-T. For labor in getting crippled cars to shop and shifting of cars for repairs and storage.
R 262 T—Account No. R-26-T. For labor in cleaning cars.
R 263 T—Account No. R-26-T. Wages of barn sweepers [Fuller Street].
R 264 T—Account No. R-26-T. Wages of barn foreman [Fuller Street].
R 265 T—Account No. R-26-T. For labor inspecting all electrical equipment of cars.
R 266 T—Account No. R-26-T. To cover time of men oiling cars at McClellan Street barn.
R 267 T—Account No. R-26-T. To cover time of men oiling cars at Fuller Street barn.
R 270 T—Account No. R-27-T. For furnishing incandescent lamps for passenger cars.
R 271 T—Account No. R-27-T. Material for cleaning cars.
R 272 T—Account No. R-27-T. Sundry car service supplies, such as lanterns, wicks, globes, oil, waste, headlight, carbons, etc.
R 280 T—Account No. R-28-T. For labor in getting derailed cars on track.
R 283 T—Account No. R-28-T. Heating McClellan Street car barn. Order to include cost and delivery of coal, cost of handling cinders, cost of cleaning boiler and wages of fireman.
R 284 T—Account No. R-28-T. Heating Fuller Street car barn. Order to include cost and delivery of coal, cost of handling cinders, cost of cleaning boiler, wages of firemen.
R 285 T—Account No. R-28-T. Sundry car barn supplies, such as toilet paper and soap for Fuller Street barn.
R 286 T—Account No. R-28-T. For sundry car barn supplies, such as toilet paper and soap at McClellan Street barn.
R 290 T—Account No. R-29-T. Cleaning and sanding track. City of Schenectady. Order to cover cost of sand and handling of same.
R 1645 P—Repairs to cars damaged by outside parties, to be charged to them.
R 1398 P—Experimental work, G. E. Co.

and shop force and on all blank forms used throughout the shops. For instance, on the daily time sheet the working order number is all that is required in designating the job worked on. Although the list of working order numbers appears long, the men soon learn them by heart, and as a matter of fact, none of the shop men is required to memorize all of the numbers, but only those referring to the class of work on which they are regularly engaged.

Referring again to Fig. 1, A and B, it will be noticed that the sheets give cost of labor and material for the various items, but do not give quantities of material. In this connection emphasis is laid on the fact that the management is interested primarily in cost rather than in quantities. Of course, records of quantities are kept and reported, but it matters not so much to the managing department to know how many brake-shoes, for instance, were used in a given period, but it does want to

COST OF MAINTENANCE FOR THE WEEK ENDING______________190

WORKING ORDER NO.	WORKING ORDER NOS. COVERING	SUN.		MON.		TUE.		WED.		THU.		FRI.		SAT.		TOTAL LABOR	TOTAL MATERIAL	TOTAL LABOR AND MATERIAL
		LABOR	MATER'L	LABOR	MATER'L	LABOR	MATER'L	LABOR	MATER'L	LABOR	MATER'L	LABOR	MATER'L	LABOR	MATER'L			
R 30 M	Labor and Material, Maintenance Fuller St. Barn																	
R 35 M	" " " McClellan St. Barn																	
R 60 M	" " " Air Comp. McClellan St. Barn																	

FIG. 1A.—FORM FOR TABULATING DAILY COST OF LABOR AND MATERIAL USED IN MAINTAINING EQUIPMENT

MATERIAL DISTRIBUTION FOR THE MONTH OF______________190

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
33 in. Wheels Keystone																																
" " " H																																
" " Taylor																																
Brake Shoes																																
57 Axles																																
67 "																																
73 "																																
57 Pinions																																
67 "																																
73 "																																
57 Gears																																
67 "																																
73 "																																
57 Am. Repairs																																
67 " "																																
73 "																																
57 Low Arm.																																
67 " "																																
73 " "																																
57 Arm. Liners																																
67 " "																																
73 " "																																
57 Axle Liners																																
67 " "																																
73 " "																																
B. 21 E Journ. Box Liners																																
B. 27 G " " "																																
Stev. " " "																																
Anger " " "																																
B. 27 E 1 " " "																																
B. 27 E 2 " " "																																
57 Motor Fields																																
67 " "																																
73 " "																																
57 Brush Holders																																
67 " "																																
73 " "																																
Brushes																																
12 ft. Trolley Poles																																
13 ft. " "																																
Trolley Wheels																																
Sleet Wheels																																
Trolley Harps																																
Lamps 16 c. p.																																
Babbitt Metal																																
Window Glass																																
Motor Grease																																
Gear Grease																																
Journal Oil																																
Engine Oil																																
Journal Packing																																
Hand-hole Plates 57																																
" " 67																																
" " 73																																
Black Oil																																
Head Light Globes																																
Local Cars																																
Troy Cars																																
Albany Cars																																
Cost of Labor																																
Cost of Material																																
Car Mileage Per Day																																

FIG. 2.—MATERIAL DISTRIBUTION SHEET, MADE UP FROM STOREKEEPER'S REQUISITION SHEETS

COST OF MAINTENANCE FOR THE MONTH OF______________190

WORKING ORDER NO.	WORKING ORDER NOS. COVERING	WEEK ENDING		WEEK ENDING		WEEK ENDING		WEEK ENDING		WEEK ENDING		WEEK ENDING		TOTAL LABOR	TOTAL MATERIAL	TOTAL LABOR AND MATERIAL
		LABOR	MATER'L	LABOR	MATER'L	LABOR	MATER'L	LABOR	MATER'L	LABOR	MATER'L	LABOR	MATER'L			
R 30 M	Labor and Material, Maintenance Fuller St. Barn															
R 35 M	" " " McClellan St. Barn															
R 60 M	" " " Air Comp. McClellan St. Barn															
R 61 M	" " " " Fuller St. Barn															
R 90 M	" " Repairing Fenders															
R 090 M	" " " Express Cars															
R 91 M	" " Painting Car Bodies															
R 091 M	" " Repairing Sand Boxes															
R 92 M	" " " Car Bodies															
R 092 M	" " " Electric Heaters															
R 93 M	" " " Registers															
R 093 M	" " " Electric Head-lights															
R 94 M	" " " Air Brake Equipment															
R 95 M	" " " Car Signs															
R 095 M	" " " Trucks Dam. in accident															
R 96 M	" " " Trucks, Maintenance															
R 096 M	" " " Car Bodies, dam. in accid't															
R 97 M	" " " Snow Scrapers on Cars															
R 097 M	" " Turning Down Flat Wheels															
R 98 M	" " Repairing Emergency Brakes															
R 99 M	" " Inspecting Trucks															
R 100 M	" " Repairing Motors															
R 101 M	" " " Car Wiring															
R 102 M	" " " C-8 Controllers															
R 0102 M	" " " Armature Liners															
R 103 M	" " " K-Controllers															
R 104 M	" " " Contactors & Rev. Switches															
R 0104 M	" " " Elec. Equip. Dam. in accid't															
R 105 M	" " " Trolley Poles															
R 106 M	" " " Armatures															
R 109 M	" " " Elec. Equip. Express Cars															
R 120 M	" " " Snow Plows															
R 130 M	" " " Shop Tools, Etc.															
R 260 T	" For Cleaning Lamps, Lanterns, Head-lights, Etc.															
R 261 T	" Getting Crippled Cars to Shop															
R 262 T	" Cleaning Cars															
R 263 T	Wages, Barn Sweepers															
R 264 T	" " Foremen															
R 265 T	Labor, Inspecting all Elec. Equip. of Cars															
R 266 T	" For Oiling Cars at McClellan St. Barn															
R 267 T	" " " " Fuller St. Barn															
R 270 T	Furnishing Incandescent Lamps for Passenger Cars															
R 271 T	Material for Cleaning Cars															
R 272 T	Sundry Car Service Supplies, Lanterns, Etc.															
R 280 T	Labor, Getting Derailed Cars on Track															
R 283 T	Heating McClellan St. Barn; also Cost of Coal															
R 284 T	" Fuller St. Barn; " " "															
R 285 T	Sundry Car Barn Supplies, Fuller St. Barn															
R 286 T	" " " " McClellan St. Barn															
R 287 T	Labor and Material, Maintenance, Air Comp. 420 State St.															
R 290 T	Handling Sand for Cars															
R 27 T	All Lubricants for Cars															

Cost of Labor, Car Cleaning Only, Per Month,		Total Car Miles Per Month,	
" " " " " Per 18 Hour Car,		Total Car Hours Per Month.	
" " " and Material, Including Car Cleaning, Per 18 Hour Car,			
" " " " " Not Including Car Cleaning, Per Car Mile,		Local Cars, Average Per Day,	
		Albany " " " "	
		Troy " " " "	

FIG. 1B.—FORM FOR TABULATING WEEKLY COST OF LABOR AND MATERIAL USED IN MAINTAINING EQUIPMENT know how much was spent for brake-shoes. Having determined the cost of maintaining brake-shoes, the manager can, if he so desires, look deeper into the kind and number of shoes used and the conditions under which they ran.

From the sheets 1, A and B, the management is enabled to keep close watch of the all-important items of cost of labor and material. If cost of labor is running high, inquiry is made to see if competent labor is being used and if the working force is being handled to give best results. If cost of material is running high, the "whyfore" can be determined and checked at once.

The sheet given in Fig. 2 shows distribution of material and serves as supplementary to the report of costs given in 1, A and B. These sheets are all 16½ ins. high x 15 ins. wide. They are printed on thin paper so that blue print copies can be made direct from the original. The sheets are bound in a loose-leaf binder.

Sheets, Fig. 1, A and B, are made up direct from the shopmen's daily time tickets, these tickets, as before stated, being made out to give the working order number of the job worked on. The material distribution sheet, Fig. 2, is made up from the storekeeper's requisition receipts.

THE MEETINGS OF THE HEADS OF DEPARTMENTS AT CAMDEN

In the April 15 issue of this paper particulars were published of the investigation of all delays to the car service in Camden, N. J., by a committee which meets daily, and which is made up of the heads of the departments of the South Jersey Division of the Public Service Corporation. In addition to the work of this committee a meeting is held twice a month in the evening, by the different foremen, of which there are about seventeen, to study means for improving the service. The practice was instituted by W. E. Harrington, formerly general superintendent of the Public Service Corporation, and, for convenience, the gathering is termed "The South Jersey Electrical Society."

The scope of the work was described by the chairman at the initial meeting, held Dec. 7, as follows:

"In all our discussion we are going to use the Street Railway Journal to work on. I hardly think there is any necessity of making rules and by-laws, but we are open to suggestion. In the matter of procedure it is the purpose to designate certain ones to open discussion on various subjects with the Street Railway Journal as their guide. The speakers may go into as much detail as they desire. In thinking this matter over it has occurred to me to appoint certain standing committees to look after certain features and make reports as things come up, and with that thought in mind I give them here ad seriatim.

"If you will look over this paper you will find that some attention is paid to the subject of latest patents. There is to be a committee of two to look over the patents, and if there is anything there of especial interest they are to make mention of it, and if it is of sufficient importance in their judgment they are to send to the Commissioner at Washington for it, as the copy of any patent can be bought for 5 cents. It is then to be brought here and filed with the secretary. With that end in view, and with that definite understanding, I will appoint on that committee Messrs. Crawford and Fisher. They are to scan over the patents each week from the Nov. 12 issue on.

"I have also found in going over the Street Railway Journal and other papers that it pays to study the advertising columns thoroughly, as every once in awhile something comes up that is valuable to know, and as this is properly a matter of detail, half a week would provide sufficient time to carefully scan over the advertising columns in order to bring to the attention of this body such new features as are advertised commercially and might be of interest. The duty of this committee will be to report each meeting night as outlined above. That committee will consist of J. R. Wilson and H. A. Johnson, and will be called the committee on technical advertising."

Committees were also appointed on alternating-current transmission; on single-phase motors; on freight and express; on track and roadbed; block signals; store room and accounts; transportation, amusement and business inducements; standard rules for the government of employees; buildings and structures; car maintenance and improvement of railway equipment; overhead lines, and safety of passengers.

The chairman later announced that the discussions would not be confined to articles in the Street Railway Journal, but that an interesting article appearing in any paper, which attracted the attention of some member, could be made the subject of discussion.

To illustrate how the association works, the meeting on Dec. 7 was devoted to a consideration of the Indianapolis Traction Terminal Building, as described in this paper for Nov. 12, and the discussion was opened by Mr. Hewitt. He pointed out the features which seemed to him desirable, such as that the cars enter at one end and pass out at the other, and that there is an opportunity to inspect the cars as they pass over the pits; that the offices were located adjoining the building was very convenient. The principal criticism on the building was that there was considerable unutilized space.

Mr. Rudderow then discussed the editorial on the recent report of the Interstate Commerce Commission, as printed on page 867 of the same issue.

The meeting on Jan. 12 was opened by J. R. Wilson, of the committee on advertising, who read a short description of an air sanding apparatus which had been advertised in the paper and to the manufacturers of which he had written for printed matter. On motion, the matter was referred to the committee on car maintenance and improvement of railway equipment to make a report at the next meeting, with instructions to obtain prices on this and similar apparatus. Mr. Wilson then described a patent cable joint and a time clock, both of which had recently been advertised. After some discussion as to their value, both subjects were referred to the committees most interested for further information in regard to prices and desirability.

Mr. Hewitt, the superintendent of transportation, then reported that he had obtained some figures on a new amusement used at Atlantic City, Coney Island and other places, and upon vote the data collected by him were turned over to the committee on amusements. The subject of steel wheels was brought up by Mr. Crawford, chairman of the committee on maintenance and improvement of railway equipment, and the matter was referred to Mr. Wilson to obtain prices and other data.

The next subject brought up at the meeting was that of stock room accounts, and the chairman of this committee requested that all departments should bring copies of each of its forms at the next meeting. In speaking on the subject of accounts and forms, the chairman brought out several points which are often overlooked. He said that all forms used for the same purpose in the different departments should be of uniform size as far as possible, and that the size should indicate something. There should also be something distinctive which would catch the eye so that each would be readily recognized. The arrangement should be such as to leave a space in the lower right-hand corner where a figure of merit or percentage could be entered. The power station form used in Camden illustrates this feature very well. The advertising report employed in Camden is another good example. It shows three figures, which summarize the entire report. The first gives the total amount of money that is being realized per annum for the spaces now sold or contracted for. The next shows the value in dollars and cents of the still unsold space. The last and most important figure is the one which shows the percentage which the unsold space bears to the total. From this report it is easy for anyone to tell at a glance whether the sale of advertising space is increasing or decreasing. The most essential feature, in the opinion of the chairman, was that already mentioned, which is to allow a space in the lower right-hand corner to show a figure of merit. He also referred to the car house foreman's report on the amount of money spent daily in repairs as one where such a record would be very desirable.

The next question discussed was a consideration of the system of the Portland Railway Company, of Portland, Ore., which was described in the STREET RAILWAY JOURNAL for Dec. 31, 1904. This company uses a special type of maximum traction truck, and a discussion followed on the merits of this truck and on the comparative value of center pivotal and maximum traction trucks for city service. The meeting closed with a talk by the chairman on the expense of claims and the need of taking every precaution to avoid accidents.

The meeting on Feb. 2 was devoted largely to a discussion of the advisability of the use of platform gates, similar to those employed by the Twin Cities Rapid Transit Company. Mr. Rudderow, who read a report which he had prepared on this subject, stated that in Minneapolis the use of this gate had almost entirely eliminated the class of accidents caused by persons attempting to board or alight from moving cars. He then gave statistics showing the number and cost of accidents from this cause on the Camden road. It appeared that the cost of equipping cars with this gate was about $32 for the gate; that the cost of installation was about $18 additional per car, and that the cost of maintenance would be about $10 per car per year. A committee, consisting of Messrs. Crawford and Haag, was instructed to prepare plans for the equipment with gates of one of the company's latest double-truck semi-convertible cars, the gates to be operated from each end of the car by the motorman.

The meeting closed with a discussion of the relative merits of stopping cars on the far and near side of the street, and the possibility of using air whistles for notifying pedestrians and vehicles to get off the track. The chairman of the committee on accidents was requested to correspond with street railway companies to find out their practice in this matter.

Rather an extended account has been given of the proceedings of this society because its plan of work is somewhat unique and should be followed with excellent results. It need only be said that members have authority and are expected to look up information, and to obtain it may visit roads out of Camden.

The discussion at the meetings is taken down by a stenographer, who separates the remarks of each member and assembles them under the several names, and sends it to the different members to examine and correct. Upon receipt of the corrections, the discussion is mimeographed for permanent record and copies are sent to each member.

The "Clover Leaf" (steam) is figuring on working up a heavy Sunday excursion business in connection with the electric lines in the vicinity of Toledo this summer. The Lake Shore Electric; Detroit, Monroe & Toledo, and Toledo & Western will have special cars to connect with Clover Leaf trains at Toledo. The Dayton & Troy; Western Ohio, and Fort Wayne, Van Wert & Lima lines will connect at Delphos, and the Indianapolis & Northwestern Traction Company at Frankfort. The steam road will have special trains out of Frankfort and Toledo, and the electric lines will serve as feeders and handle through tickets in either direction. The Lake Shore Electric has made an arrangement with the Indianapolis & Northwestern whereby through tickets are now being sold from Cleveland to Indianapolis by way of the "Clover Leaf."

REBUILT TIRE-TURNING LATHE

BY JOHN MILLAR

Many interurban systems desirous of adopting rolled-steel or steel-tired wheels are prevented from doing so by reason of their inability to properly care for their wheels after the treads and flanges have shown sufficient wear to warrant being "turned up." With the use of steel or steel-tired wheels comes the additional cost of a wheel-turning lathe, for if the road using these wheels has no facilities for regrinding tires it is severely handicapped, and in many cases the road will be compelled to have its wheels "turned up" outside of its own shop. Therefore, the economy of these wheels, with respect to the first cost and the cost of maintenance, has been a much discussed subject, and for this reason the following description of a tire-turning lathe lately rebuilt by the International Railway Company, of Buffalo, at its Cold Spring shops, may be of interest:

This lathe, when new, was a 10-in. swing-axle lathe with single tool carriage. By means of intermediate castings, the head and tail stocks were raised so that it now swings 36 ins. An extra tool block and carriage was designed in order that both wheels could be "turned up" simultaneously. Both tool blocks are fitted up with compound rests, the feed mechanism being controlled by an eccentric on main spindle connected by chain to rocker shaft above and then to ratchet levers on the tool rests.

The bed of lathe was securely bolted in cement foundation 12 ins. below the floor, keeping the center of head and tail stocks 3 ft. 5 ins. from floor, thus greatly facilitating the handling of wheels. To get the required speed it was necessary to make a reduction from 35 ft. to about 6 ft. per minute. This was accomplished by double gearing, 9 to 1, then 5 to 1, and using a three-step cone.

The wheels are driven by two powerful drivers, fitted with an adjustable driving force plate which is 34 ins. center to center of drivers. This locates the driving power as near the outer edge of the wheel as possible.

The results obtained after the lathe was finished were in excess of the expectations, the present average work accomplished being the "turning up" of four pairs of wheels per day of ten hours.

The cost of remodeling this lathe, including patterns, castings, machine work and other incidental expenses, was less than $350. Needless to say, the lathe, while in operation but about six months, has practically paid for itself and is proving a big saving to the company.

Another very useful and interesting feature is, that when necessary, a cut or worn journal can be "trued up" without removing the wheels from the axle. This is done by using an auxiliary tool rest with an extension to carry tool, the speed being accelerated by the shifting of an intermediate gear, changing it to that formerly used for turning axles; the feed mechanism consisting of the original feed driven by a chain belt from the elevated head—that is, when the head stock was elevated, the driver and driven feed gears were separated about 16 ins. By replacing these two gears, the one on the spindle and the one on the stud, with sprocket wheels and installing a chain belt, the feed mechanism of lathe is brought back to its original ratio when used as an axle lathe.

The statement is made that American interests identified with the proposed plan for constructing some 240 miles of street railways in St. Petersburg, Russia, at a cost of about $50,000,000, have declared negotiations at an end for the time being. In the latter part of 1904 it was believed that the war between Japan and Russia was nearing an end and that work would be commenced on the construction of the system this year.

APRIL MEETING OF THE INDIANA ELECTRIC RAILWAY ASSOCIATION

The Indiana Electric Railway Association held its April meeting at Indianapolis the 13th inst. President Charles L. Henry was in the chair. The ticket committee presented a report, which was read by W. R. McKown. He reviewed the work of the committee in collecting data, which, previous to the March meeting, had forced the committee to the conclusion that because of the great variation in rates per mile charged for passenger tariff by different Indiana interurban roads no mileage ticket could be devised which could be used by all roads, and that therefore a ticket book of 5-cent coupons sold at a reduced rate would be the only solution of the difficulty. The committee had thought that such a book containing 200 5-cent coupons should be sold for $9, making it equivalent to a 10 per cent reduction from regular rates. In accordance with the instructions given the committee at the last convention, the committee had met with the committee of the Ohio Interurban Railway Association at Cincinnati, on March 23, to try to figure out some compromise which would be acceptable to both Indiana and Ohio roads. The Ohio interchangeable ticket book gives 16⅔ per cent reduction from the regular fare, while the committee was sure that Indiana companies would not go into an agreement to give a reduction of more than 10 per cent from the regular fare. The committee from Ohio was not favorable to reducing the discount from 16⅔ per cent to 10 per cent, because it felt that it would prevent the extensive use of the ticket in Ohio, on account of the small reduction it afforded. The regular passenger fare rates were higher in Ohio than in Indiana, being about 1½ cents per mile on roads centering at Columbus, 1¾ cents on roads centering at Dayton and 2 cents per mile on roads centering at Cleveland and Toledo. This being the case, the Indiana committee, Mr. McKown reported, felt that it had worked hard to solve the problem, had spent much time and thought upon it, but had failed to secure a satisfactory compromise. It could not recommend to the association the adoption of its first plan of a coupon book sold at 10 per cent reduction, because it was questionable whether a 10 per cent reduction would be sufficient to cause extensive sale of the book. It would be a mistake to issue two different kinds of books, one in Ohio and another in Indiana. If the 16⅔ per cent reduction given in Ohio was recommended but few Indiana roads would adopt it. All the committee could do therefore would be to recommend that no interchangeable coupon book be adopted at the present time. With regular rates of fare varying all the way from 1¼ cents to 2¼ cents per mile, an adjustment satisfactory to all is evidently impossible. The only solution seems to be in a readjustment of the rates charged by some of the roads. As the present committee's duty was not to regulate rates, it felt that it had no authority to act in the matter. The committee therefore asked to be discharged.

A motion to discharge the committee brought the matter before the meeting for discussion. An expression of opinion was asked from the various members of the committee. C. A. Baldwin said it did not look possible to come to a conclusion now. Companies should make their passenger rates as near alike as possible. Mr. McKown said all seemed to be in accord as to the desirability of uniform rates. Mr. Norviel said he would like to see a committee on rates appointed to determine whether the roads could not get together on that basis. The question of rates was at the root of the whole matter. Referring again to the interchangeable coupon scheme, the round-trip rate on the Indiana Union Traction lines is already 10 per cent less than the one-way rate, so that a coupon book at 10 per cent discount and costing $9 would not find much sale. Mr. McKown pointed out that the Ohio ticket with its 16⅔ per cent reduction can now be adopted by any Indiana road that will sign the Ohio agreement.

President Henry suggested that a mileage ticket sold at a certain rate per mile would equalize the differences in rates of fare, which differences now stood in the way of a coupon book giving a uniform percentage of reduction on all rates of fare. Why not agree on a certain rate per mile for an interchangeable mileage book? Mr. Norviel suggested as a way out of the difficulty that a committee on rates consisting of the general manager of each road take up the question of more uniform passenger tariffs.

President Henry said that the question is one that must be settled. It could not be dropped, and the association must not take any action that would give such an impression to the general public. Mr. McKown, in answer to a question, stated that the average rate of fare on the roads that had reported to the committee was 1.77 cents per mile.

It appears that all the Indiana roads objected to a 16⅔ per cent reduction for an interchangeable coupon book, and that the only ones that would be at all willing to enter such an agreement would do so only for the sake of uniformity if all the other roads favored it.

The ticket committee was then discharged, and a committee consisting of one from each interurban railway in the State was decided upon. This committee is to take up the rate question, and being composed principally of the general managers is in a position to act with some authority. The questions of interline coupon tickets and checking of interline baggage were also later left to this committee.

This committee, as far as appointed at the meeting, was composed as follows: Indianapolis, Columbus & Southern Traction Company, W. G. Irwin, general manager; Indianapolis & Northwestern Traction Company, C. C. Reynolds, general manager; Indianapolis & Eastern Railway Company, J. W. Chipman, general manager; Angola Railway & Power Company, C. C. Wood, general manager; Indiana Northern Traction Company, J. A. Barry, general manager; Fort Wayne & Wabash Valley Traction Company, C. D. Emmons, general manager; Terre Haute Traction & Light Company, Gardner F. Wells, general manager; Indiana Union Traction Company, H. A. Nicholl, general manager (C. A. Baldwin, alternate); Muncie, Hartford & Fort Wayne Railway Company, L. J. Schlesinger, superintendent; Richmond Street & Interurban Railway Company, Willard Parry, auditor; Fort Wayne, Van Wirt & Lima Traction Company, H. F. Dicke, auditor; Kokomo, Marion & Western Traction Company, T. C. McReynolds, manager; Lebanon & Thornton Traction Company, Robert P. Woods. Other interurban companies not having representatives at the meeting are to appoint their own representatives to meet with the committee.

F. D. Norviel, general agent of the Indianapolis & Northwestern Traction Company, read a paper on "Tickets, Their Use and Abuse," which is printed in abstract elsewhere. This paper favored the adoption of the steam road plan of making all passengers purchase tickets as far as possible. In addition to his paper, Mr. Norviel gave some figures taken from actual experience on various roads running out of Indianapolis. These figures showed that on the way out from the city it takes conductors from fifteen to thirty-five minutes to collect the fares from a carload of passengers, on account of the large amount of labor connected with the cash-fare system, in addition to the conductor's other duties.

W. G. Irwin, general manager of the Indianapolis, Columbus & Southern, said that the principal question that would come up if such a ticket system as Mr. Norviel advocated were adopted on his road would be how to care for the passengers who board the cars at the country cross-roads. Any system which required an excess fare from passengers paying cash fare would work a hardship on a large number of this class of regular patrons, as they would have no place to purchase tickets.

In answer to this, Mr. Norviel said that his company sold a twenty-ride ticket good going in either direction for the use of just such passengers as these.

A vacancy in the executive committee having been created by the resignation of A. L. Drum, Mr. White moved that H. A. Nicholl, Mr. Drum's successor as general manager of the Indiana Union Traction Company, be elected to succeed Mr. Drum on the executive committee. This was carried.

Secretary White then read the names of thirty-five applicants for membership approved by the executive committee, all of whom were elected members of the association. The convention then adjourned.

In the afternoon the party was the guest of the Indianapolis & Eastern Railway Company. A special car, called the Spring Lake Special, took the party first to the company's power house at Spring Lake Park, near Greenfield, and then on to Dublin, the eastern terminus of the company's line. The road for its entire distance runs alongside the old National Pike, and is almost a continuous village from one end to the other, so thickly are the farm houses scattered along this pike. The trip was therefore a very interesting one. The road is now a part of the route of the Interstate Limited, running from Indianapolis to Dayton. The return run was made in fifteen minutes better time than that of the Interstate Limited, Dublin being left at 3:42 and the car arriving at the Indianapolis terminal depot at 5:30.

The party was under the escort of J. W. Chipman, general manager; C. E. Morgan, auditor and purchasing agent; D. H. Robinson, superintendent, and W. R. McKown, general passenger agent.

"TICKETS, THEIR USE AND ABUSE"*

BY F. D. NORVIEL

That the use of tickets on steam roads has been a success and the proper way to handle the traveling public is proven by the great amount of money spent annually for them. The same should be true of the electric line after it passes the point of a suburban and becomes the interurban. In other words, when the electric line becomes a railroad reaching from one city to another city, say 25 or more miles away, it seems that the same conditions that make necessary a system of tickets on a steam road would apply to the electric line of the same length.

When a line decides to put in a ticket system, the question of local ticket agent comes up. This means expense. Does it pay? My answer to this is "Yes," because then your prospective passenger has some one to whom he can go to and get such information as he may want to complete his journey, not only over the one particular system that originates this travel, but to others as well; and the further the originating office can put that man on a through ticket the more sure we are that each electric road affected will get that customer's business. How can this condition be procured but by educating the agent, circulating appropriate literature and adopting interline tickets. You cannot do this and change your agents every month. Make the inducement such that your agent is proud to be called one, and will not only go out and hunt for business, but get it, too. That all electric lines will eventually come to this, I do not believe that any officer will deny. We know there will be continually further consolidation of interests, which makes all the greater need for permanent organization of the passenger department.

As to the kind of tickets and their use, it would seem that inasmuch as the steam roads have paid for the best brains to be had in the last fifty years to devise a system, we could at least adopt that system as far as it will fit our case. We all know the use of a local card ticket, both one way and round trip. The custom of the steam road is to charge for a round-trip fare double the one-way fare less 10 per cent. Why this reduction? First, because the road has the use of a certain amount of money before it is earned. Second, by the purchase of a round-trip ticket the chances are one hundred to one that the passenger will return as he went—over your own line. These card tickets should be used to whatever point there is any considerable travel, because of the ease in accounting and the rapidity with which they can be handled. For those odd points to which the sales are few, use a blank stub. If excess-fare trains are run, a special ticket should also be provided for them.

The coupon tickets good over other lines should be provided with sufficient coupons to fit the conditions. A mileage book is a good thing, and it's a pity we haven't an interchangeable one, because a man holding a book of this kind will hardly consider the rival steam road in his calculations. We have several other ticket forms on the Northwestern to fit local conditions, all of which when delivered to an agent mean so much money for which he must account.

Another reason for the use of tickets is the comparative ease with which a conductor can handle a train when tickets are used, as against a train where a complicated system of cash-fare registers are employed.

It would seem to the writer that the same reason in favor of making a way-bill for freight or express would apply in the case of tickets for passengers, and a well-regulated system should reduce the cash fares to about 20 per cent of the business. There is probably no system of fare or ticket collection but can be manipulated for a time, but it is certainly a hard proposition either to alter the tickets or do anything with them after they have once been punched and used.

In conclusion, I would offer a suggestion that 5 cents extra be charged on the train when a ticket is not presented, and the cash-fare receipt, worth 5 cents, be returned to the passenger, good at any regular ticket office of the company if presented within ten days from date of issue. This would, I think, reduce cash fares to a minimum.

* Abstract of a paper read before the Indiana Electric Railway Association, at Indianapolis, April 13, 1905.

THE INDIANA ELECTRIC RAILWAY GUIDE

The first issue of the Indiana Electric Railway Guide, published by Paul Richey, has appeared. This guide was authorized at the Anderson meeting of the Indiana Electric Railway Association. It is under the supervision of a committee of that association, although it is a private enterprise carried on by Mr. Richey. It contains a map of Indiana and Western Ohio electric railways and the time-tables of fifteen interurban roads, all of which are located in Indiana, except the Dayton & Western Traction Company, which operates the Interstate Limited cars between Dayton, Ohio, and Indianapolis, Ind. The Guide will be published once a month.

Notwithstanding the heavy traffic of the World's Fair year, the report of the United Railways Company for the quarter ending April 1, 1905, shows that fewer trips were made by the company and more passengers were carried than in the corresponding period last year. The report sets forth that 1,187,152 trips were made in the quarter just ended, as against 1,233,074 for the corresponding period in 1904. The number of passengers carried in the first three months of 1905 is given as 37,007,639, as against 35,731,471 for the first quarter of last year. According to these figures, the United Railways is carrying 1,276,168 more passengers in the first quarter of 1905, as against the same period in 1904.

CORRESPONDENCE

THE PROPER DESIGN OF CAR FOR INTERURBAN SERVICE

Chicago, Ill., April 15, 1905.

EDITORS STREET RAILWAY JOURNAL:

When we take into consideration the conditions and the obstacles to overcome, we fully realize that it is almost impossible to design an ideal car. An interurban car, in addition to operating at high speeds in the open country, must be operated on city streets and upon short radius curves, which make it impossible to use successfully very long cars. Were they employed entirely upon private right of way it would be possible to make them very much longer, but under present conditions and limitations they cannot usually be made to exceed 50 ft. over all. The ordinary schedule of most interurban roads calls for a single car at hour or half-hour intervals. To provide for extra heavy traffic, the question comes up as to how cars shall be operated, whether in trains or in single cars? The operation of several separate cars as different sections of the same train running on the time of one train introduces some very objectionable features in operation. There is inevitably a delay at each passing point because of the time required for the second and third sections of the train to arrive at the turn-out and to depart therefrom with a sufficient time interval between them. Furthermore, such operation destroys many of the benefits that might be obtained from any block-signal system that may be installed, as it necessitates two cars in a block at the same time and makes possible rear-end collisions, even if the block-signal system is in use. If turn-outs are placed frequently enough so that the number of cars can be increased by shortening the headway between cars to, say, 15 minutes, there is much chance for delay at turn-outs (because of the short distance between meeting points) and for interference with the schedule of the whole system by delays at one or two points.

It is evident to the writer, for the reasons just set forth, that the best way to provide for extra travel which calls for more cars than are run on the regular schedule is to add to each regular train. Some managers believe that the adding of more cars to a train should be done by the use of trailers, but there are serious objections to this method. With one car equipped with large motors and used as a locomotive, the cutting out of a disabled motor reduces the available horse-power so much as to cause delay and unreliable service. During a great portion of the time on most roads these motor cars would be operated singly. If the motor cars are made heavy and equipped with motors of sufficient capacity to be used as locomotives for handling trains, the expense when operating singly would be much greater than if they were constructed with motor of sufficient capacity to operate but one car at a time. Another point against the use of trailers is that it is sometimes nearly impossible to get sufficient traction for quick acceleration or for ascending grades. Perhaps the most serious objection of all to their employment is that they put an added load on the motor cars at the very time when, on account of the heavy traffic, it is most difficult to maintain the schedule.

We are therefore forced to the conclusion that to operate trains of two or more cars on an interurban road, all cars should be equipped with motors with some system of multiple-unit control so arranged that each car can be operated singly or as a part of a train. There will then be no trouble from lack of motive power at the very time when the most motive power is needed. Furthermore, in case of disabled motors, since each car is equipped with motors, the disabled motor can be cut out so that the train can proceed with but slight delay.

When interurban cars are operated in trains, whether by the trailer or the multiple-unit system, there are serious difficulties in operating such trains over city tracks or wherever there are short radius curves. Interurban cars as now usually constructed have the trucks placed from 8 ft. to 14 ft. from the end of the car. It is impossible to place them nearer the end because of the swing of the truck which would strike the steps. On account of the length of this overhang, the construction of such cars in the past has been made very heavy to overcome the trouble which would be caused by the ends dropping and getting out of line. With cars of this kind it has been found practically impossible to design draw-bars and couplings that will operate successfully around short radius curves. Of course, cars of this class are, as a matter of fact, sometimes coupled together in practice, but the arrangement is anything but a successful one. On account of the enormous overhang there must be a great amount of swing to the draw-bars, and to provide for this swing, cars must be held so far apart by the couplers when on straight track that disastrous telescoping is almost certain in case of a collision.

The writer believes that we are on the wrong track in interurban car construction. The difficulties just enumerated and a number of others would be overcome if cars were built with side entrances, having the steps and vestibule at or near the center of the car. This would make it possible to place the trucks at the ends of the car, as in elevated railway practice. The cars could be then coupled close together and there would be no trouble in securing a satisfactory draft rigging. Crown pieces or buffers at the ends of the cars should be not less than 8 ins. deep and of the same radius as the swing draw-bar, making it possible to couple the cars close together and decreasing the liability of telescoping in case of collision. Small doors could be placed in each end so that trainmen could pass from car to car in case of necessity. A car so designed would have greater seating capacity than present cars with front and rear platforms, because less of the total length of the car would be taken up by platforms. Passengers would be more directly under the eye of the conductor, since there would be but one entrance, and so there would be less likelihood of injury to passengers entering and leaving the car. The vestibule would effectually separate the smoking compartment from the other compartment, which is also desirable. Both compartments would have the advantages of almost unobstructed end views to the front or rear, as the case might be. The car would thus be more attractive and more like an observation car. The motorman's cab could be placed in each end of the car, with doors arranged so that they would fold back to cover the controller and braking apparatus after the manner of some elevated motor cars in use, thus utilizing the motorman's cab space for passengers when it is not required by the motorman. By placing the trucks under the ends of the car and doing away with the enormous overhang of the ordinary interurban car with platforms, considerable weight should be saved, because it is impossible to devise any plan of car construction whereby a great amount of overhanging platform weight can be supported without very heavy construction. The weight between trucks, on the other hand, can be supported by the truss as used on steam railroad cars, which is capable of supporting a great amount of weight with little material. No economical supporting structure, like the ordinary truss, can be used for platform supports, because there is no room for trusses, so that comparatively shallow I-beams, plates and timbers must be adopted. These I-beams and plates being shallow, must be of correspondingly greater cross section to support the weight that would be put upon them.

The center entrance car is not altogether a novelty, as it is used by at least two important street railway companies for city traffic. It is probably considered by most electric railway men as a kind of freak construction, but it is well for us to stop and inquire whether this freak construction is not nearer right than the construction we are now generally following.

S. R. S.

THE QUESTION BOX

In this issue considerable space is devoted to parks and pleasure resorts, as this is the time when railway managers are making plans for creating or increasing pleasure traffic during the coming summer. Questions and answers relating to employees are continued, those in this issue referring to methods of teaching, examining, ruling and paying car men. In the master mechanic's department there is a discussion on car types, car fireproofing and flooring, and on experience with oil and grease lubrication.

C.—PARKS AND PLEASURE RESORTS

C 1.—A company is thinking of establishing a pleasure park. Please give suggestions, ideas and pointers as to what should be done and what should not be done.

Our business is strictly urban, and we do not own or manage any parks or pleasure resorts. We have a number of city parks on our lines, also a very fine and well managed "Chutes" park, equipped with numerous pleasure features. We furnish a band of music every Sunday afternoon at one of the most attractive parks, and have found this to be a remunerative investment.

JNO. J. AKIN, Supt., Los Angeles Ry. Co.

Hire a thoroughly competent park manager. He will solve the rest.

J. R. HARRIGAN, Gen. Mgr., C. B. L. & N. and C. N. & Z., Columbus, Ohio.

I would advise a company thinking of starting a pleasure park to keep strictly within its means. Put in plenty of light and make arrangements direct with a capable architect to build a theater and an attractive entrance, a "Figure 8," and such other amusement devices as cash in hand will allow.

PAUL D. HOWSE, Gen. Mgr., The White City, Chicago.

In establishing a new park, local conditions should be well studied and considered, and the company should not be governed by the experience of railway companies in other localities, except in a general way.

J. E. STEPHENSON, Pass. and Freight. Agt., International Ry. Co., Buffalo.

In starting a park, be so strict at the beginning that none but first-class people will take advantage of the attractions offered, and very soon the other sort will learn they are not tolerated, and will stay away. In a town the size of Augusta a profitable patronage cannot be attracted if loose characters are admitted. Flowers, walks, shrubs, springs, barbecue pits, covered stands, dining hall, bowling alley, boats, electric piano, birds of different kinds, animals, fountains, shade trees, dancing pavilions open and closed, are all attractions that we have found the least expensive and most serviceable.

GEO. H. CONKLIN, Park Mgr., Augusta-Aiken (Ga.) Ry. & Elec. Co.

Purchase, lease or in some manner control not only all the land needed for park purposes, but as large an area as possible around it. Unless this is done, and if the park is a success, you will certainly be annoyed with a large number of clap-trap concerns who will locate as near as possible, and not being under the control of the park management, will almost certainly resort to questionable methods to make profits. The presence of such concerns interferes with the general reputation of the park. Buildings for use of the public are invariably built too small, and then added to from year to year, making a patchwork. If a dance hall is to be built, and it is assumed that a hall to accommodate 300 couples is about the right size, build it large enough for 500 couples. If a theater is to be built, and it is calculated that a seating capacity of 600 is about the right size, arrange to seat three times that number, and in the course of a few years the wisdom of the plan will become apparent. If you can possibly afford the space have all buildings well separated. In case of fire this is a great aid and the general appearance is much improved. Keep fakirs and liquor away.

I. W. PHELPS, Mgr. Park Dept., Dartmouth & Westport St. Ry. Co., New Bedford, Mass.

In considering the establishment of a pleasure park, the question will arise as to what sort of patronage you wish to cater to. Under some circumstances it is better to simply have what might be called an evening park. Such places depend, outside of the theaters, etc., on the tasteful illumination of the grounds, the topographical features being of secondary importance. The topographical features of a day park are the important elements, as the day patrons are generally picnicers, who are out for a day in the woods, and if it is desired to attract picnics from a distance, it is necessary to combine the essential features of the night and day park in one pleasure ground. In either case, provide a reasonable amount of shelter from sudden storms, otherwise your patronage will suffer very considerably from unfavorable weather indications. The car service must be adequate to handle the crowds quickly when they accumulate. Many people want to go home at the conclusion of the theatrical performance, and if they are kept waiting too long for lack of cars their patronage will be lessened, if not lost altogether.

GAYLORD THOMPSON, Gen. Mgr., Beaver Valley Tract. Co., Beaver Falls, Pa.

C 2.—Is it better for the railway company to operate a park and its attractions or to induce outsiders to operate them on a percentage basis?

We think it is better for the railway company to operate the park.

W. W. SARGENT, Mgr. Whalem Park, Supt. F. & L. St. Ry. Co., Fitchburg, Mass.

From our experience we should say it is better for the railway company to operate the park and its attractions.

J. CHAS. ROSS, Gen. Mgr., Steubenville (Ohio) Tract. & Light Co.

By all means manage your own property. Operate some of the main attractions, letting out on the cash basis only the minor ones. Never under any conditions place your company in a position to be dictated to by lessees.

J. R. HARRIGAN, Gen. Mgr., C. B. L. & N. and C. N. & Z., Columbus, Ohio.

Inasmuch as the attractions and amusements of the average park must be of a nature entirely foreign to street railroading, it does not seem that a railroad company could operate attractions with the same skill as men schooled in that line of business.

J. E. STEPHENSON, Pass. and Freight Agt., International Ry. Co., Buffalo.

Our experience would tend to show it is better to give the attractions to an outsider.

GEO. H. CONKLIN, Park Mgr., Augusta-Aiken (Ga.) Ry. & Elec. Co.,

Our experience is that it is much more desirable for the railway company to control the operation of a park. Where it is left entirely in the hands of individuals, whose entire object is to get as much as possible out of the crowd each day, questionable methods are resorted to and complaints are numerous. We have found it best to let out certain privileges for a fixed rental and others for a percentage of receipts and to operate others ourselves, reserving the right to oversee the operation of all privileges and to have a prompt remedy applied to anything not meeting with the approval of our park manager.

I. W. PHELPS, Mgr. Park Dept., Dartmouth & Westport St. Ry. Co., New Bedford, Mass.

From our experience in the past in furnishing attractions at the different parks, aside from band concerts, and in view of our "Chutes" park being so well equipped, we have found it to our interests not to furnish any attractions at the parks except music, turning all applicants over to the "Chutes" people, and assisting them some in the way of furnishing power and by a monthly contribution.

JNO. J. AKIN, Supt., Los Angeles Ry. Co.

In my judgment, it is absolutely necessary for the railway company to exercise full control of the park business. Refreshment privileges are usually sub-let upon a basis of from 10 per cent to 20 per cent commission on the gross receipts. It has become the general practice of amusement companies to install roller coasters, merry-go-rounds and other mechanical contrivances upon a rental basis of 20 per cent to 25 per cent of the gross receipts, a lease for a term of from five to ten years usually being given such companies. As to these privileges the traction company should be very exacting, and insist that the concessionaires give full value to the park patrons in exchange for their nickels. The dancing pavilion, the music and the theatrical performances should be controlled absolutely by the street car company. In general, grounds and buildings should be kept scrupulously clean, courteous attendants and ample police protection provided, and when all this is done the company can consider itself fortunate if the enterprise has been managed so as to make the park receipts just meet the park expenses. Anything short of this effort may result in making a little money in the park for a season or two, but the people will soon notice the neglect and refuse to patronize the park.

Gaylord Thompson, Gen. Mgr.,
Beaver Valley Tract. Co., Beaver Falls, Pa.

In the writer's opinion a railway company should never operate its own park, as it does not know the game; the park business is a trade in itself. On the other hand, the railway company should be very careful to whom it leases its park and in whose hands it places the management.

C. A. Dunlap, Pres. and Gen. Mgr.,
Electric Park Amusement Co., Newark, N. J.

C 3.—On what basis do you determine the percentage to be paid for lease of attraction privileges at your park?

Twenty-five per cent of the gross receipts.

W. W. Sargent, Mgr. Whalem Park,
Supt. F. & L. St. Ry. Co., Fitchburg, Mass.

Concessionaires pay us on an average of 20 per cent of their gross receipts.

J. Chas. Ross, Gen. Mgr.,
Steubenville (Ohio) Tract. & Light Co.

On the amount of patronage to the resort.

J. R. Harrigan, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

We determine the percentage paid for lease of attraction privileges at White City upon the basis of our knowledge of their earnings and cost of operation. We figure to divide the profits evenly with the concessionaire.

Paul D. Howse, Gen. Mgr.,
The White City, Chicago.

This would depend entirely upon patronage.

J. E. Stephenson, Pass. and Freight Agt.,
International Ry. Co., Buffalo.

See the writer's answer to C 2.

Gaylord Thompson, Gen. Mgr.,
Beaver Valley Tract. Co., Beaver Falls, Pa.

First on the amount of space the attraction may require, and second on the nature of the attraction. If the attraction is going to take in a large amount of money the park owners should receive a larger percentage, as this means less money spent in other attractions or on the owners' stands, bars or whatever they may control.

C. A. Dunlap, Pres. and Gen. Mgr.,
Electric Park Amusement Co., Newark, N. J.

C. 4.—What are some of the methods of maintaining interest of the public in a pleasure park?

Diversified entertainments, good food, music, bathing and a comfortable grove for rest in hot weather.

W. W. Sargent, Mgr. Whalom Park,
Supt. F. & L. St. Ry. Co., Fitchburg, Mass.

Keep up with the times. Have some improvements each season. Maintain good order.

J. R. Harrigan, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

By constantly adding and improving attractions, a strong musical organization and heavy advertising.

Paul D. Howse, Gen. Mgr.,
The White City, Chicago.

To maintain interest in pleasure parks new features should be continually added and well exploited by judicious advertising.

J. E. Stephenson, Pass. and Freight Agt.,
International Ry. Co., Buffalo.

At our park we have a hot house, where the year around a man propagates plants, which he puts in the different parks to make them more attractive. By means of paint, repairs, conveniences for picnics and dancing parties, a small menagerie and aviary we try to maintain interest. Moving pictures have long ceased to be a profitable attraction. During the summer months, three times a week, we give band concerts, with only fair results. At present it is our plan to inaugurate a series of sensational outdoor acts, which we will book in conjunction with the Charleston Consolidated Railway, Gas & Electric Company, of Charleston, S. C..

Geo. H. Conklin, Park Mgr.,
Augusta-Aiken (Ga.) Ry. & Elec. Co.

Provide good music for concerts and dancing, and the theater, as this is the chief magnet to draw patronage to the park; use the greatest care to obtain attractions free from all objectionable matter, and thus make the best people of your community your constant patrons.

Gaylord Thompson, Gen. Mgr.,
Beaver Valley Tract. Co., Beaver Falls, Pa.

By being able to provide something new.

G. A. Dunlap, Pres. and Gen. Mgr.,
Electric Park Amusement Co., Newark, N. J.

C 5.—What are the relative merits as drawing attractions of vaudeville and light opera?

Depends entirely on population to which the park caters. From an experience of twelve years should say opera is much the better attractions.

W. W. Sargent, Mgr. Whalom Park,
Supt. F. & L. St. Ry. Co., Fitchburg, Mass.

Light opera has proved more attractive in this section.

J. Chas. Ross, Gen. Mgr.,
Steubenville (Ohio) Tract. & Light Co.

That is impossible to answer without a trial. It depends on location and the class of patronage to whom you are catering.

J. R. Harrigan, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

Light opera is an absolute failure in an amusement park as compared with vaudeville.

Paul D. Howse, Gen. Mgr.,
The White City, Chicago.

The vaudeville appears to predominate in popularity.

J. E. Stephenson, Pass. and Freight Agt.,
International Ry. Co., Buffalo.

The people of Augusta no longer care for vaudeville, and light opera, such as we could furnish, will not attract them.

Geo. H. Conklin, Park Mgr.,
Augusta-Aiken (Ga.) Ry. & Elec. Co.

We have never attempted anything but vaudeville and can furnish no data from which a comparison could be drawn.

I. W. Phelps, Mgr. Park Dept.,
Dartmouth & Westport St. Ry. Co., New Bedford, Mass.

In our locality the vaudeville shows, when properly selected, are more favored than opera.

Gaylord Thompson, Gen. Mgr.,
Beaver Valley Tract. Co., Beaver Falls, Pa.

Vaudeville and light opera have no relation to one another whatever, and the drawing power of either depends entirely on the neighborhood and park it is in. If the people are particularly high-class and refined, light opera or comedy drama will probably be more acceptable; but to the working classes, especially, vaudeville and horse-play comedy are more acceptable.

C. A. Dunlap, Pres. and Gen. Mgr.,
Electric Park Amusement Co., Newark, N. J.

C 6.—Give some suggestions on how to make a pleasure park pay

By charging a small fee for admission to the park, and keeping the park absolutely clean at all times.

W. W. Sargent, Mgr. Whalem Park,
Supt. F. & L. St. Ry. Co., Fitchburg, Mass.

Locate it in the right place on the main line of your road. A spur track causes extra expense, and is an abomination to the handling of crowds and giving service. Choose a place with plenty of shade always, and water when it is possible. Different localities demand different amusements. Govern your expenditures and improvements by the surrounding patronage you have to draw from. Keep out, under all circumstances, grafters, hold-up schemes and objectionable characters. Establish order and maintain it. Light up the grounds. Keep close guard on your privilege contracts. Never let a foot of your park property out from under your own control. If you are operating privileges yourself, be sure and have a practical knowledge before you begin. If your park is isolated do not, under any conditions, allow intoxicating liquors in the grounds, and under no conditions let such a privilege out from under your control. Attend well to the sanitary conditions of your grounds,

toilet, cess pools, etc. Keep the walks clean and the grounds clear of all filth and rubbish. Provide plenty of house shelter and tables, seats, etc., for your patrons.
J. R. HARRIGAN, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

The largest money earner that has yet been brought out for pleasure parks is the "Figure 8." I would advise any corporation starting a park to own the largest money earners, and to let such things as merry-go-rounds, Ferris wheels, minature railroads, etc., out on percentage, but by all means own the "Figure 8" and the other big money earners.
PAUL D. HOWSE, Gen Mgr.,
The White City, Chicago.

This depends entirely upon the attendance. If sufficient patronage can be had it is an easy matter to attract amusement features of all sorts, all of which will contribute to the revenue of the park.
J. E. STEPHENSON, Pass. and Freight Agt.,
International Ry. Co., Buffalo.

This is a "stumper." We have never been able to make either of our parks pay. We have tried vaudeville at 10 cents at Monte Sano, and high-class opera and comedy plays at 25, 35 and 50 cents; but never have been able to clear expenses. At our Lake View Park, at irregular times, we have given outdoor attractions, such as aerial acts, water spectacles, fireworks, etc., but none of these has been so successful that a regular line of such attractions has been justified.
GEO. H. CONKLIN, Park Mgr.,
Augusta-Aiken (Ga.) Ry. & Elec. Co.

The primary purpose of a pleasure resort is to induce travel upon the street cars, and except where the tributary population is very large, parks are seldom paying enterprises of themselves. When properly conducted, however, they become indirectly a source of very considerable revenue to the traction company by virtue of the travel they induce.
GAYLORD THOMPSON, Gen. Mgr.,
Beaver Valley Tract. Co., Beaver Falls, Pa.

Provide amusements and attractions suitable to the people of your particular locality. Keep park and employees in order; allow no gambling or questionable shows; cater to the middle classes.
C. A. DUNLAP, Pres. and Gen. Mgr.,
Electric Park Amusement Co., Newark, N. J.

C 7.—What is the best form of theater for an ordinary electric railway park? Please discuss seating arrangements, methods of supporting roof, acoustic properties, arrangement of stage, etc.

Enclosed stage, auditorium with open sides.
W. W. SARGENT, Mgr. Whalom Park,
Supt. F. & L. St. Ry. Co., Fitchburg, Mass.

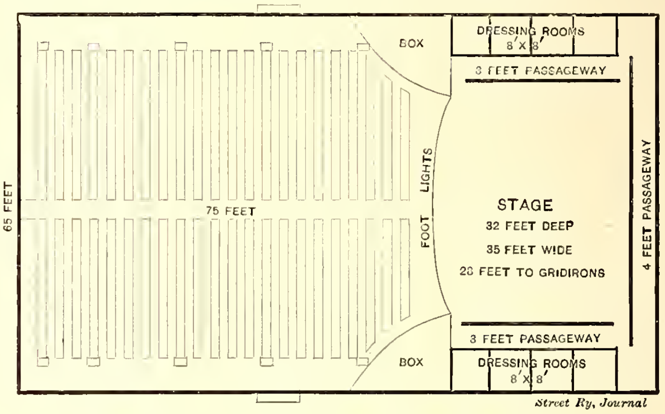
Here, again, locality governs one's opinion and decides architectural arrangements. Never lose sight of the fact that you cannot pack people into a small, illy-ventilated building and expect to hold their patronage. Arrange your seating on one main floor with plenty of exits. Allow for ample stage room, as you cannot give a satisfactory performance without it. Prepare good sized, well ventilated dressing rooms, and your performers will give you better work. If the acoustics are bad put in a sounding-board.
J. R. HARRIGAN, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

A practically closed but well ventilated theater. Seats should be arranged in sections of not more than eight each. The roof should be supported by trusses and sealed underneath with ⅝-in. beaded and center beaded yellow pine, the beads running perpendicular to the stage. This increases the acoustic properties greatly and makes an inexpensive and very satisfactory finish. The stage should be arranged with drop curtains and wings, with, perhaps, two sets of flash scenery.
PAUL D. HOWSE, Gen. Mgr.,
The White City, Chicago.

Next year we expect to make a very attractive theater on the side of a hill, which has a grade of about 15 per cent. The stage will be at the base of the declivity. We will make seating arrangements for about 1500. Will use canvas side walls, which can be lowered in case of storm, with both ends enclosed, and having a shingled roof.
GEO. H. CONKLIN, Park Mgr.,
Augusta-Aiken (Ga.) Ry. & Elec. Co.

The form of theater depends entirely upon the topography of the pleasure grounds. The very best arrangement, where the topography is adapted to it, is an open-air theater, without any covering but the blue sky and the foliage of the overhanging trees. In a flat country, where a building must be provided, it should be of the open-type form of construction, and of dimensions suitable to the seating capacity of the attendance to be expected. A population of 30,000 should yield an average nightly attendance of 1200 people. There is nothing unusual in the design of the roof trusses for such buildings, and it is not at all difficult to take care of the acoustic properties of the interior.
GAYLORD THOMPSON, Gen. Mgr.,
Beaver Valley Tract. Co., Beaver Falls, Pa.

A building having a roof but with all sides open, and with stage sufficiently large to enable aerial acts to be used. One of the most common faults with park theaters is the building of a small and low stage, with the result that acts that would be a real novelty and draw large crowds of patrons cannot be put on, or if put on must



THEATER AT LINCOLN PARK, NEW BEDFORD

be so cut that the novelty is lost. There should be no posts located in auditorium, and the line of vision from the rear of auditorium, looking toward top of the stage, should not be less than 26 ft. from the floor of the stage. Roof can be supported by trusses so that this result can easily be obtained.
I. W. PHELPS, Mgr. Park. Dept.,
Dartmouth & Westport St. Ry. Co., New Bedford, Mass.

B.—EMPLOYEES

B 12.—If you have a regular school, please give full description of the apparatus used and the methods of teaching.

We have been holding a school for motormen and conductors during the past winter, but it was optional with employees as to whether they should attend.
E. J. RYON, Supt.,
Schenectady Ry. Co.

We have an instruction room with skeleton car equipped with all apparatus with pit so that everything can be easily gotten at and described. In this room are copies of all rules and regulations, map of our lines and samples of electrical apparatus, all of which are explained by the student instructor. The men are then assigned to motormen on the different lines and required to run on each line under instructions of motorman in charge. Blank cards are used for this purpose with space for car number and motorman to whom assigned, motorman to state on this card time student was on and any remarks.
JNO. J. AKIN, Supt.,
Los Angeles Ry. Co.

We have no regular school, unless the use of the student's car mentioned by the writer under B 11 might be considered in that light.
S. W. CANTRIL, Supt.,
Denver City Tramway Co.

B 13.—Do you require accepted applicants to pass an oral or written examination before they are put to work? If so, please send list of questions asked.

Applicants are required to pass an oral examination.
E. J. RYON, Supt., Schenectady Ry. Co.

Applicants must pass satisfactory examination as to their knowledge of the rules in the rule book.
J. R. HARRIGAN, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

Oral examination is required. We have a printed card with a large number of questions covering phases of their work. If the student instructor on the final examination concludes the new men are not fully capable of taking charge of a car, he gives further instructions and requires further experience in charge of other men, watching them himself in the performance of their duties. We also have inspectors on the road whose duty it is to watch all trainmen in regard to performance of duty and report any incapacity or violation of rules. Jno. J. Akin, Supt., Los Angeles Ry. Co.

They are examined orally in questions pertaining to the time-card and the operation of the road. C. E. Palmer, Supt., Cincinnati, Dayton & Toledo Tract. Co.

We require an oral examination from special list of questions. J. Chas. Ross, Gen. Mgr., Steubenville (Ohio) Tract. & Lt. Co.

We require written examinations which are kept on file. We are now revising our list of questions.
S. W. Cantril, Supt., Denver City Tramway Co.

B 14.—Please send copies of any special rules for the government of conductors and motormen which you think particularly desirable.

This company is about to adopt the rules of the American Street Railway Association subject to whatever changes may be necessary to fit them to our lines. E. J. Ryon, Supt., Schenectady Ry. Co.

Our book of rules is an adaptation of the regulations approved by the American Street Railway Association in September, 1903, and so far we have found it quite satisfactory. We also found that by having our transfer regulations printed in a separate book in convenient form for carrying in the pocket we aided our conductors in avoiding errors in issuing and receiving transfers.
S. W. Cantril, Supt., Denver City Tramway Co.

B 15.—What is your process for paying off motormen and conductors?

Motormen and conductors are paid off with a pay envelope and required to sign a pay slip. E. J. Ryon, Supt., Schenectady Ry. Co.

Conductors and motormen are paid four times a month, two days pay always being kept back. J. E. Duffy, Supt., Syracuse Rapid Transit Ry. Co.

By check, monthly. J. R. Harrigan, Gen. Mgr., C. B. L. & N. and C. N. & Z. Columbus, Ohio.

We pay off in envelopes from a regular pay car on the tenth and twenty-fifth of each month. C. E. Palmer, Supt., Cincinnati, Dayton & Toledo Tract. Co.

Pay semi-monthly for hours actually on duty on car.
J. Chas. Ross, Gen. Mgr., Steubenville (Ohio) Tract. & Lt. Co.

Conductor pays himself and motorman out of the car receipts at the end of each day's work. S. W. Cantril, Supt. Denver City Tramway Co.

B 16.—Has the method of letting conductors and motormen take their day's wages from each day's receipts proven satisfactory?

I would not consider it a good practice.
C. Loomis Allen, Gen. Mgr., Utica & Mohawk Valley Ry. Co.

We have never given this a trial and I do not approve of such practice. E. J. Ryon, Supt., Schenectady Ry Co.

Has never been the practice with these companies. Do not think it would be satisfaetory. J. R. Harrigan, Gen. Mgr., C. B. L. & N. and C. N. & Z. Columbus, Ohio.

Yes. We have used the system for the past 13 years and would not now willingly change it. It saves many disputes over wages, is easily and cheaply handled by the company, and is popular with the men. S. W. Cantril, Supt., Denver City Tramway Co.

E.—THE MASTER MECHANIC'S DEPARTMENT

E 3.—What is the best type of car for cities of less than 50,000 population? Why?

Longitudinal seats; wide single door; door to right of center; large platform; step on right-hand side. These arrangements give ample standing room; passengers can get in and out easily with door at corner, and side seats enable passengers to signal conductor without turning around. This car is easy to keep elean and in repair. J. Chas. Ross, Gen. Mgr., Steubenville (Ohio) Tract. & Lt. Co.

E 6.—What is the best type of car for a combined city and suburban service?

Double-truck car with side seats at end and cross seats in middle of car. J Chas. Ross, Gen. Mgr., Steubenville (Ohio) Tract. & Lt. Co.

E 7.—What is the best type of car for moderately high-speed suburban service (suburban service as distinguished from interurban service)?

A car 40 ft. over all, with cross seats in center and longitudinal seats 10 ft. long at each end giving room near doors for a standing load in the cities. Francis G. Daniell, New York City.

E 8.—What is the best type of car for high-speed interurban service?

Double-truck car with cross seats and smoking compartment. If cars have long runs, a small baggage compartment, water cooler and flush closet should be provided. J. Chas. Ross, Gen. Mgr. Steubenville (Ohio) Tract. & Lt. Co.

A car about 50 or 60 ft. over all, with baggage and smoking compartment in front end; baggage compartment to contain heater and to be used as cab for motorman. In interurban cars running on private right of way, a toilet should be provided either at rear end or next to partition between smoking compartment and day coach. On this type of car no front platform is necessary, and no entrance for passengers at forward end of car. Rear platform should be large and have sliding doors on each side; swinging doors are continually breaking hinges and getting out of shape as platform sags. A car 55 ft. over all is a good size for general use. A longer longitudinal seat than is usually provided is an advantage as providing more room near the door. The space of two cross seats is small enough.
Francis G. Daniell, New York City.

E 10.—What is the longest car that can be carried safely and economically on a single truck?

A 20-ft. car. J. Chas. Ross, Gen. Mgr., Steubenville (Ohio) Tract. & Lt. Co.

An 18-ft. body is as long as should be carried on a single truck with 7 ft. 6 in. wheelbase. Francis G. Daniell, New York City.

E 11.—What can the master mechanic of the average surface road do to render his cars more nearly fireproof?

Pay careful attention to all places where wires go through platforms and see that they are protected with rubber hose extending well above the floor. Also see that underside of floor over all resistances, lightning arresters, etc., is covered with asbestos board.
Francis G. Daniell, New York City.

Fires are often started in cars by the light wires coming in contact with the electric bell wires. As a rule, in cars where the push button for signalling conductor is used the light wires and electric bell wires are just above the side windows, and very close together. In order to lead the bell wires down the window post to the push button the light and bell wires generally cross each other, giving good opportunity for a short circuit. To reduce the danger place the bell wiring under molding below the window sill. Again, where the motor cables are fastened to the bottom of the car there is always chance of short circuits and grounds due to water from the street being thrown up on the cables. To do away with this put the cables inside the car in wooden boxes along the floor under the seats. Where necessary to pass under platform to controller rubber lined cotton hose is a good protection. I consider this method the best outside of conduit wiring.
J. L. Sullivan, Foreman, Motor & Truck Dept., United Rys. Co., St. Louis.

E 14.—What is the best form of flooring for the inside of cars?

For side seat cars, longitudinal strips screwed to floor; for cross seat cars, smooth floors. J. Chas. Ross, Gen. Mgr., Steubenville (Ohio) Tract. & Lt. Co.

Floors inside of cars should be covered with hardwood slats screwed to floor. In wet weather this prevents the floor from getting sloppy. It is also a very good plan to slat the platforms, as the motorman standing in one place will wear hollows in the floor, and in wet weather these will fill with water so that the motorman will be standing in water all the time. Also, the strips take all the wear and are much more cheaply replaced than the floor itself. The platform strips should be maple, about ⅜-in. high by ¾-in. wide. Francis G. Daniell, New York City.

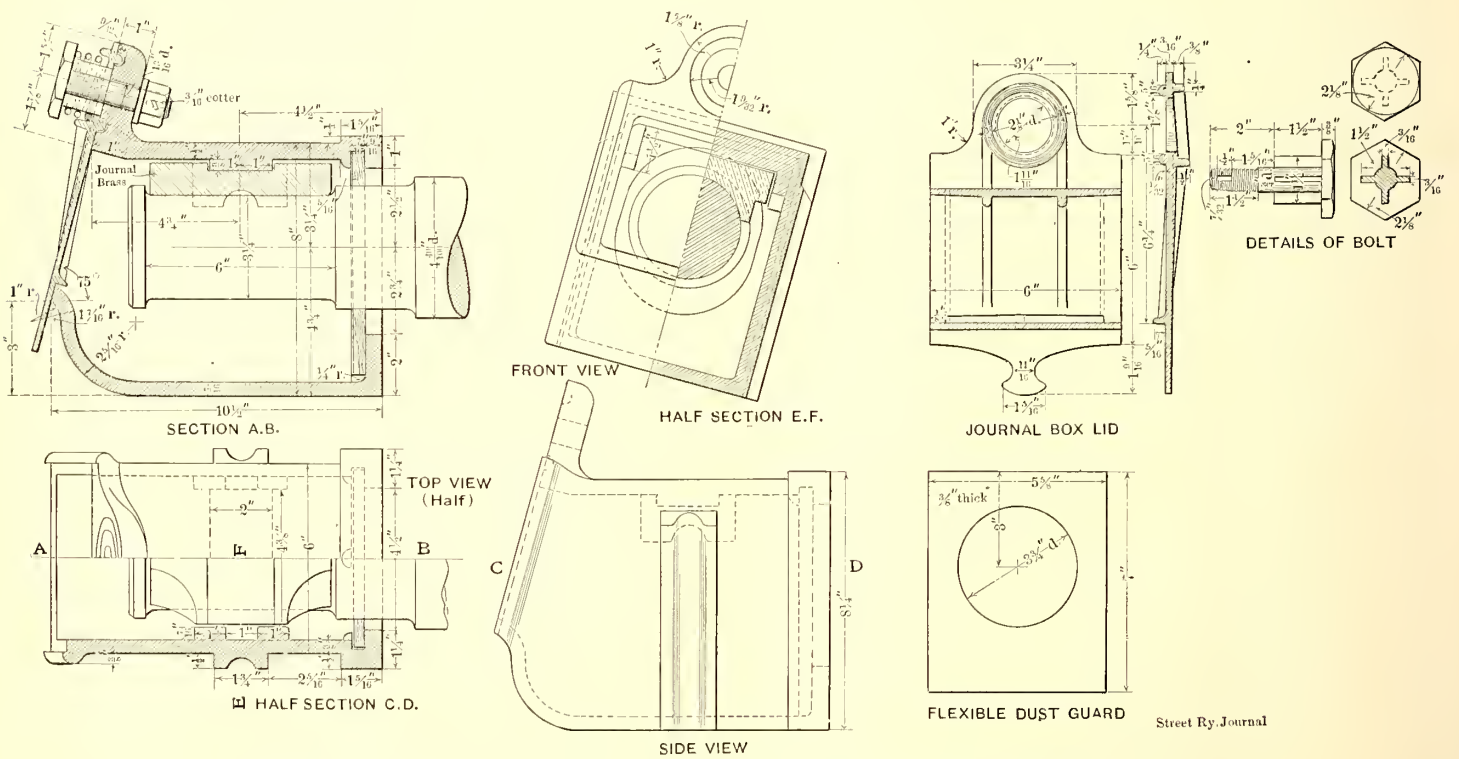
E 46.—State experience with use of oil instead of grease for motor lubrication.

Experience shows oil to be a more satisfactory lubricant than grease for armature bearings, because it can be applied to the bearing with more certainty and regularity. The average life of the bearing is longer with oil lubrication than with grease.

Master Mechanic.

E 47.—Give description, with sketch of journal box, suitable for using oil for motor lubrication.

The accompanying drawings illustrate a form of journal-box that has been developed for service on the electric railway lines controlled by the Boston & Maine Railroad. The chief advantage is covered with oil, but that the oil has been forced over the box and out on to the side of the wheel. Another advantage is found in the fact that inasmuch as the dust guard can be inserted from the front end when the box is in actual service on the car or from the back when setting the trucks up, we are not obliged to have a hole either in the top or bottom of the oil box, and this I consider a decided advantage for the reason that any opening either in the top or the bottom of the oil box, no matter how well it may be protected, always leaves a place for the entrance of dirt and dust, which are always present at this point when the car is in motion. There are one or two features in connection with the front end of the box which we have found particularly advantageous. It will be seen from the section A-B, and also from the drawing of the journal box lid, that there is an inclined plane upon which the holding spring rests, and as the bolt which holds the lid on is borne up firmly on the shoulders of the lid, this spring is compressed more on the lower side than it is on the upper, giving the box lid a decided tendency to press harder against the lower part of the box. The ribs on the inside of the lid are not decidedly new, as they have been used in other types of boxes, both for steam and electric railway service, but the writer considers that these ribs are very necessary, as the oil from the outer ends of the journal is thrown up against the lid, and by having this shelf or rib, as shown on the inside of the lid, the oil runs down and is thrown off into the box, instead of running out at the front end of the box, as it certainly would do if the inside of the lid was a plane surface. With this oil box, we are using standard makes of lubricating oil and packing with decidedly good results on both city and interurban cars. We have also put this type of box on to some of our snow plows, and the results have been very satisfactory, so satisfactory, in fact, that we have not had a single hot-box where this form of box and dust guard was used. The drawings give details for journals, 3¼ ins.



DETAILS OF JOURNAL BOX USED ON ELECTRICAL DIVISIONS BOSTON & MAINE RAILROAD

in the use of a flexible dust guard which is made up of layers of flexible material sewed firmly together, and the arrangement is such that the dust guard can be inserted from the front end of the box without removing the box from the journal, thus avoiding unnecessary expense and delay attendant upon the use of many of the various types of dust guards commonly used in electric railway work, most of which require that the box shall be removed when applying the guard. Another advantage of this dust guard is that, as it is made of flexible material, it conforms itself to the back part of the journal and acts to form an absorbent ring, which effectually prevents any oil from going out through the back part of the box, and is much more satisfactory than the harder substances commonly used for dust guards. We have had cars running in our electric railway service for over a year with this type of dust guard, and upon personal inspection the writer has found that the back end of the box outside of this dust guard is always perfectly dry, while with the use of various types of dust guards in the same service the writer has frequently found not only the back part of the oil box x 6 ins. It might be necessary in adapting this box to various forms of trucks to modify the shape somewhat, but this is a simple matter of detail that any master mechanic can arrange, but we have found the flexible dust guard and the use of a lid or cover of this design so advantageous that we are glad to present the idea as a suggestion to others for what it may be worth.

E. T. Millar, Chief Draughtsman,
Electric lines controlled by Boston & Maine R. R.

ADDITIONAL QUESTION ON A—GENERAL

A 51.—What is the best method of destroying tickets? If a machine is used for this purpose, what is the maintenance expense and what would be the power required for a machine capable of handling daily 300,000 tickets and transfers and macerating unused transfer pads containing 100 transfers bound with wire staples?

OVERHEAD TRAVELER SYSTEM IN NEW YORK

One of the most interesting features of the inspection shed and repair shop recently completed for the New York Subway at Seventh Avenue and 148th Street is the overhead conveying system installed by the Northern Engineering Works, of Detroit. This consists of an electric traveling hoist and an overhead track which connects the different buildings. The space covered is practically an entire block, the blacksmith and paint shops at the north end being separated from the main building by an electrically-operated transfer table.

This overhead electric system, sometimes called telpherage, was installed for the rapid conveyance of machinery and tools to any part of the shops without interference with the work done on the floor.

The track is a 15-in. I-beam bolted to the under side of the roof truss. It runs the entire length of the north and south bays of the inspection shops, crossing the middle bay at either end. Branch tracks, supported by steel trusses, extend over the transfer table and run the length of the blacksmith and paint shops. Curves, track switches and turntables enable the traveling hoist to reach the elevator in the storeroom, as well as other parts of the building, where there are special tools. The traveling electric hoist has a capacity of 4 tons. It has been of great service, during the fitting up of the shop, in installing the machine tools, rotary transformers, motors and other machinery. Since the shops have been in operation the hoist has been in constant use, mounting motors on the car trucks, replacing car wheels, taking armatures or any other

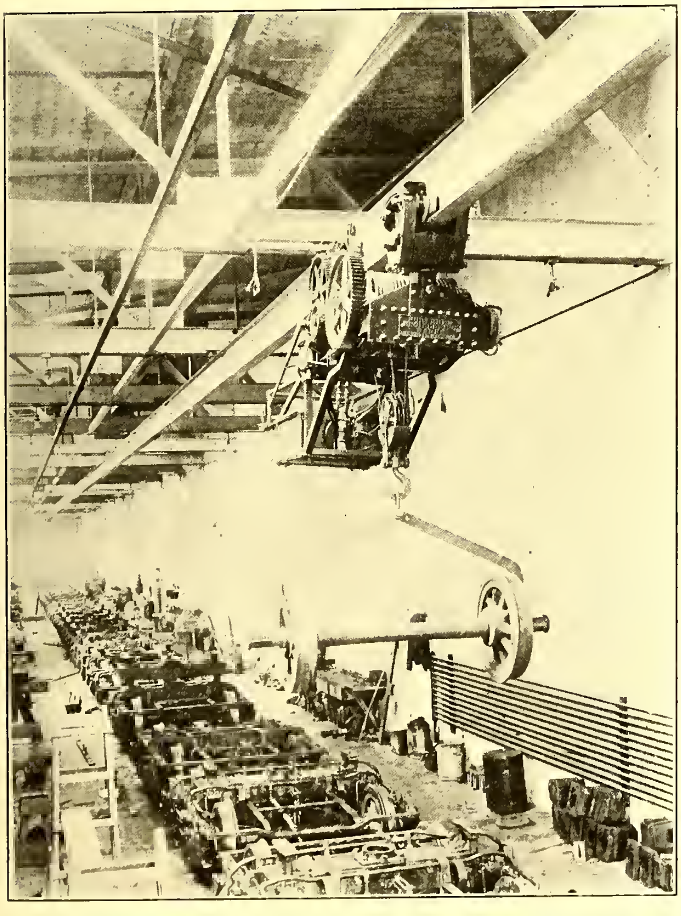


FIG. 2.—HOIST CARRYING PAIR OF CAR WHEELS IN SHOP

parts of the cars to the machine tools for repair, etc. The motors on every subway car fitted up in this shop have been put in place by this machine.

Fig. 1 shows the hoist traversing a curve. The turntable is also shown in this view. Fig. 2 gives another view of the hoist, carrying a pair of car wheels along a straight section of the track.

The length of the track and the variety of uses for which the hoist is employed make this system of particular interest. No passageways have to be kept open and no floor space is used, consequently there are no delays in handling any of the

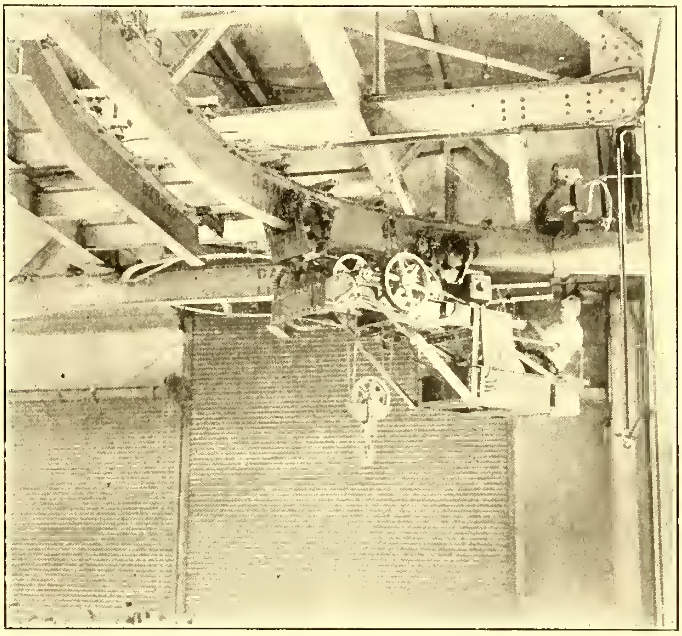


FIG. 1.—THE HOIST TRAVERSING A CURVE

machinery or in transferring materials from one building to another.

J. Van Vleck and W. C. Phelps, of the Interborough Company, assisted by R. A. Byrns, of the New York office of the Northern Engineering Works, are responsible for the general design and the layout. The entire system was manufactured and installed by the Northern Engineering Works.

CLOSED CARS FOR WASHINGTON, D. C.

The Capital Traction Company has recently placed in operation twenty-three closed cars built by the J. G. Brill Company. This traction company operates about 625 cars, with 40 miles of trackage, and owns the attractive amusement resort known as Chevy Chase Park. The company's lines touch all the various points of interest in and about Washington.

The new cars are 17 ft. 8 ins. over the corner posts and 7 ft. 8 ins. wide. Inlaid mahogany with floral designs and decorated

ONE OF THE LATEST CLOSED CARS FOR THE CAPITAL TRACTION COMPANY

birch ceilings constitute the interior finish. The seats are 18 ins. wide and are upholstered in hair and covered with plush of old gold. For summer use, seats are provided with slat bottoms and backs. The furnishings include Brill angle-iron bumpers, "Dedenda" gongs, sand boxes and folding gates.

The general dimensions of the cars are: Length of the car body over crown piece, 24 ft. 6 ins.; width of the car body over the sills, 6 ft. 2 ins.; length of the platform, 3 ft. 5 ins.; height of the car body from the floor to the top of the roof, 8 ft. 1 in.; height of the door in clear, 6 ft. 3½ ins.; side sills, 4½ ins. x 6⅛ ins.; intermediate corners, 2¾ ins. x 4½ ins.; crown pieces, 3½ ins. x 10 ins.; corner posts, 3¾ ins. thick, and thickness of the side posts, 1¾ ins.

NEW JOURNAL BEARING

It is pointed out by many practical railway men that the wick or pad oilers now in common use for journal bearings soon become gummy and develop a hard polished contacting surface which the oil cannot penetrate. This is due to their being pressed against the journal, whereby the fibres of the material become so packed that the oil cannot get through. In a short time the dry fibres are carbonized by the friction of the journal,

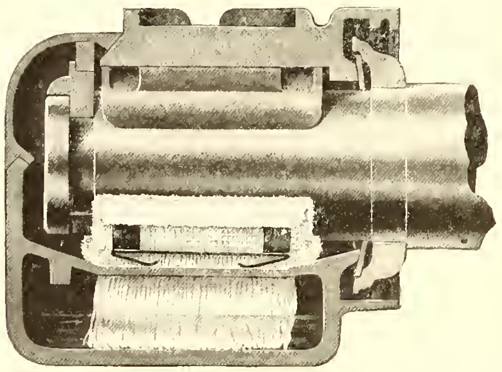


FIG. 1.—SECTIONAL VIEW OF JOURNAL BOX, SHOWING OILER IN POSITION

forming a hard abrasive surface that is very severe on the life of the journal and its bearings.

To overcome this defect, the Armstrong Journal Oiler Company, of Philadelphia, has brought out the radically different type of oiler shown in the accompanying illustrations. The material used is a combination of cotton and wool woven into a plush pad, but only the buttons shown in Fig. 2 press against the journal, so that the "pile" of the plush is allowed to brush it but lightly. It is the use of the buttons in this manner that forms the main feature of the Armstrong oiler, as the pressure of the revolving journal is taken up by the buttons and not by the plush "pile." The oil is always fed freely and uniformly, because the tips of the plush "pile" cannot be pressed down and solidly massed until the buttons are worn down, and their life is longer than that of a truck. It is stated that if this oiler be given an annual bath in hot water, to dissolve and wash out the grease, it will last for many years.

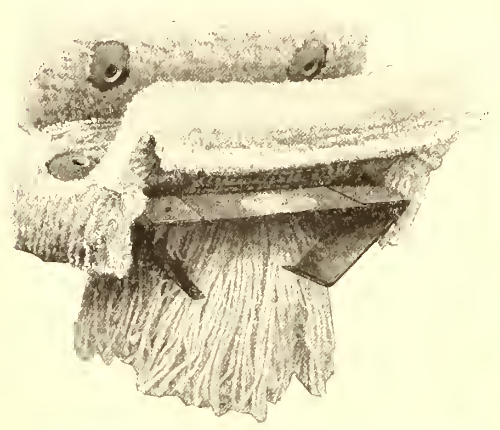
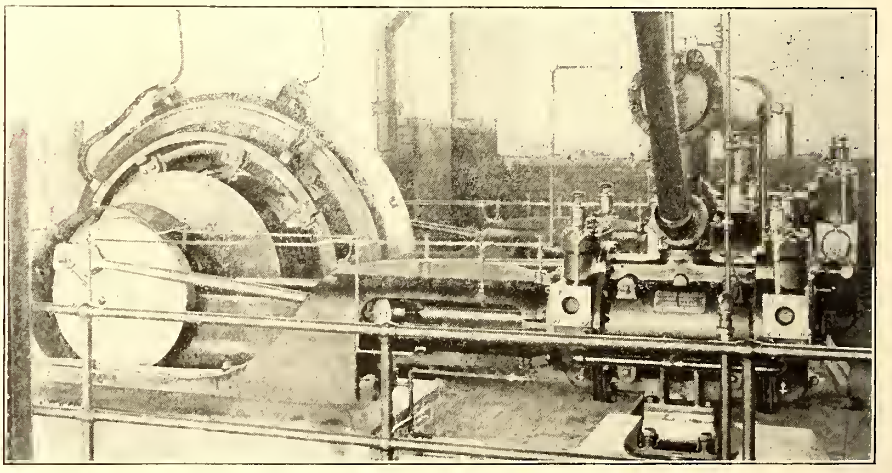


FIG. 2.—SHOWING THREE OF THE BUTTONS WHICH PRESS AGAINST THE JOURNAL

ELECTRIC-DRIVEN AIR COMPRESSORS

Power-driven air compressors are usually provided with either belting or gearing for the transmission of power to the compressor shaft. However, belting requires a great deal of floor space and is a source of constant expense, both on account of lost power and the cost of maintenance. Gearing is more compact and more sightly than belting, but is noisy and even more subject to wear and friction.

The compressor shown in the accompanying illustration, recently built by the Laidlaw-Dunn-Gordon Company, solves this question of power transmission. It was built for the General Electric Company to be driven by a 150-hp motor, the armature of which is mounted directly on the compressor shaft. The air cylinders of this machine are 18 ins. and 11 ins. in diameter, respectively, with a common stroke of 24 ins., the entire outfit operating at a speed of 120 r. p. m. and giving a displacement of about 850 cu. ft. per minute against 100 lbs. air pressure. The frame construction is of the Laidlaw-Dunn-Gordon standard rolling mill type, the motor being placed directly between the frames. This compressor is fitted with the Cincinnati valve gear, the essential feature of which is the mechanical closing of the discharge, as well as the mechanical control of both the opening and the closing of the suction. This results in perfectly quiet action and good efficiency at speeds impossible with the ordinary poppet or semi-mechanical valve gears. The stumbling block in the way of high compressor speeds heretofore has been the lack of a means for controlling positively these three constant points in the compression cycle without destroying the flexibility of the machine by also fixing the point of opening of the discharge. Other compressors control the opening and closing of the suction mechanically, but this is not enough, since the closing of the discharge by means of poppet valves involves, at high speeds, not only rattle and noise, but also the choice of two other evils, namely, a considerable loss through back blowing, caused by sluggish closing of the discharge if light discharge-valve springs are used, or a very considerable energy loss caused by throttling through the valves if springs sufficiently heavy to close the valves sharply are employed. The real importance of



MOTOR-DRIVEN AIR COMPRESSOR

this point will be realized when it is considered that for good efficiency the discharge valve must continue to give a fair opening up to the very end of the stroke, and must then close before the return stroke has progressed more than a small fraction of its total length. The smaller the fraction the better, in fact. Roughly speaking, to prevent serious loss by back blowing, the discharge valve should close in about one-fortieth of the time occupied by a revolution, and as the poppet valve must have some weight to stand the impact resulting from this sharp action, it will be seen that considerable force is required to overcome the inertia due to this weight and accomplish the necessary travel in the almost inconceivably short time available.

On the other hand, numerous ways have been designed for accomplishing mechanically both the opening and closing of the discharge valves, but these constructions either involve a fixed point of opening of the discharge, allowing the machine to run efficiently at only one pressure, or else they involve so much complication in the way of automatic release gears as to prevent high speeds, also making the cost of construction almost prohibitive. It is claimed that the Cincinnati gear retains the elasticity and simplicity of a poppet discharge opening, the opening of the discharge being the only variable point in the cycle, and at the same time controls mechanically the fixed points of discharge closing and suction opening and closing. This point is explained at some length, in order that it may be understood just why Cincinnati machines can be directly connected to motors having fairly high speeds, as described above, without the sacrifice of efficiency which would accompany the use of other commercial gears on the same service.

CHOKE COILS

Lightning arresters are employed to relieve the line of abnormal rises of potential due chiefly to static disturbances, while it is the function of choke coils to prevent such disturbances from entering the apparatus which they protect. The choke coil operates on the principle that a coiled conductor presents a greater resistance to the passage of an electric current of high frequency than to one of relatively low frequency; therefore, though a coil may have a very slight resistance to direct current or to alternating current of from 3000 to 7300 alternations, its resistance to lightning discharges or other static disturbances, which always occur very suddenly, may be very great.

In order that the choke coil may perform its duty successfully, very great care must be exercised both in its construction and in its installation. The Westinghouse Electric & Manufacturing Company, which was a pioneer in the use of these devices as a means of protecting electrical apparatus, has for the past twelve years been engaged in the manufacture of choke coils and the development of protective appliances for circuits of both high and low potential.

FIG. 1.—CHOKE COIL FOR RAILWAY CIRCUITS

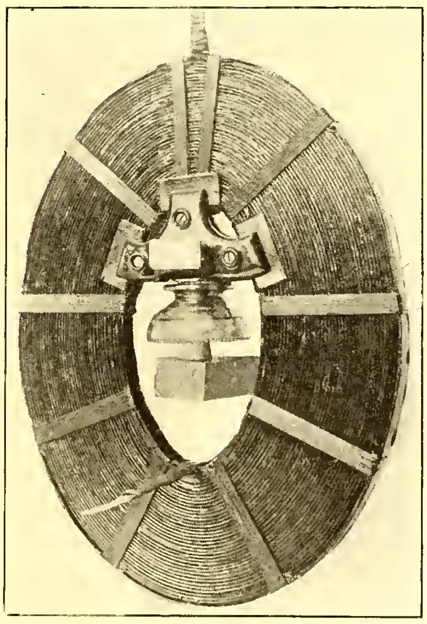


FIG. 2.—DISC FORM OF CHOKE COIL FOR ALTERNATING CURRENTS

For low-voltage circuits, such as railway work, the form illustrated in Fig. 1 has been developed. The conductor is coiled in the form of a cylinder and is mounted on a wooden spool, each turn being insulated from its neighbor and the completed coil skilfully protected from moisture and dampness. The lightning arrester is connected to a terminal plate laid across a few turns of the line end to provide a selective path to earth.

In alternating-current work, the disc forms of coil, as shown in Fig. 2, have been found to give the best protection. The insulation of these disc form choke coils, which are known as the Westinghouse type 7, has great dielectric strength and extends beyond the sides of the conductor, so that there is little likelihood of the discharge jumping from terminal to terminal or from layer to layer. The coils are constructed with a large factor of safety. Very large cooling surfaces are provided. As the coils are wound with but one turn per layer, every turn is exposed on two sides and offers a maximum radiating surface to the cooling influences of the surrounding air. As these coils are connected in the line, it is desirable to mount them on insulators capable of withstanding the line voltage. The coils must also be held securely against the side pull due to magnetic action. To meet these conditions the support illustrated in Fig. 3 has been developed. It is very strong, and the insulator which accompanies it has given excellent service at the voltages for which choke coils of this type are designed.

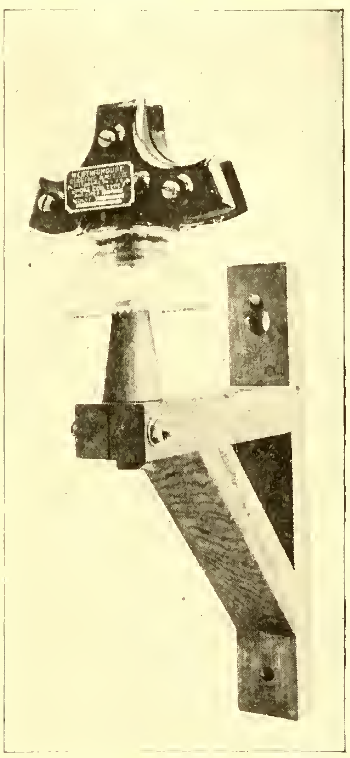


FIG. 3.—CHOKE COIL SUPPORT

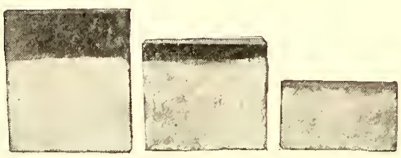
Coils of this type vary in the size of the conductor and in the number of turns, depending upon the current and voltage of the apparatus which they are intended to protect. They are manufactured in a great many different capacities, ranging from 7 amps. to 200 amps., and from 2500 volts to 25,000 volts, inclusive. Coils of the same type have been successfully used for the protection of apparatus with a potential lower than 2500 volts, where the conditions are such as to require protective devices of this form.

For apparatus with potentials higher than 25,000 volts, two forms of choke coils have been developed, viz., the oil-immersed choke coil and the static interrupter. Oil immersion improves the insulation, while the addition of a condenser such as is used in the static interrupter makes it possible to reduce the relative size of the coil, at the same time providing increased protection. Either of these devices can be made to afford effective protection against powerful disturbances. Both are immersed in oil and can be either of the self-cooling or water-cooled type. The oil-immersed choke coil is mounted on a wooden frame and is ventilated in such a way as to maintain a temperature uniform in every part. The ventilating ducts when filled with oil add greatly to the insulation between layers, and they are so arranged as to promote a natural circulation of oil around the coil. The cases in which these coils are mounted, in general, resemble those standard for Westinghouse transformers. They are constructed with the greatest care and include fibre tubes designed to protect and insulate the leads.

Many designers of electric plants seem to believe that the number of lightning arresters determines the number of choke coils which should be used, but such is not the case. As has been said, lightning arresters relieve the outside lines of static disturbances, while the choke coils protect the inside apparatus from static disturbances, not only those which occur on the line, but also those which are set up by switching. Consequently, in general, there should be but one arrester connected with each outside line and one choke coil or static interrupter connected to each motor, generator or transformer switchboard lead.

COMMUTATOR COMPOUNDS AND CARBON BRUSHES

Since the time the first commutators gave evidence by destructive sparking that they had lost their original smoothness, an endless number of compounds have been devised to keep the commutator from becoming roughened. Most of these are long forgotten, but at least one has stood the test of time successfully and is used more widely than ever. This particular compound is known as "Hiko," and is now made by the Atlantic Manufacturing Company, of Allenhurst, N. J. When a machine is started with a smooth commutator, the latter will be kept perfect by the application of this compound, which soon produces the desired hard face and gloss, and thus increases the life of the commutator and brushes many times. By using this mixture no sandpapering of the commutator is necessary and



A COMPARISON IN BRUSH WEAR

the friction is reduced to a minimum. The compound contains no acid, and as it is an excellent non-conductor there is no danger of short-circuits between the commutator segments, such as happen soon or later where oils or paraffine are constituents of the compound.

The company also manufactures the "Hiko" carbon brushes, which are especially adapted for street railway and other service where it is difficult or inconvenient to apply a commutator compound. It is claimed that these brushes give 300 per cent more mileage than ordinary brushes in street railway work. This is shown graphically by reference to the accompanying illustration, where the first brush is new and of the same size as the original sizes of the other two, the middle brush representing the "Hiko" after 9850 miles' travel, and the one on the right an ordinary railway brush after 5300 miles' service.

With these brushes there is no scratching, both commutators and brushes remaining as smooth as glass. Brushes of such quality, of course, reduce friction, insure the better contact due to a smooth commutator, and by avoiding excessive heating effect a considerable saving in power cost.

A new form of transfer is in use on the lines of the Rochester Railway Company, of Rochester, N. Y. On this the name of the line issuing the transfer, with the day and date, are plainly printed. The conductor is required to make two punch marks only, instead of four, as formerly. One object of the new transfer is to eliminate the collection of transfers punched with the wrong date, or the use of old transfers. The new form contains also a printed paragraph calling attention to the penalty prescribed by the State law for the misuse of a transfer.

LEXINGTON (KY.) RAILWAY STOPS TRAFFIC FOR FIVE MINUTES ON GOOD FRIDAY

The Lexington Railway Company, at the solicitation of Baker P. Lee, dean of Christ Church, of Lexington, Ky., will cut off current for five minutes on Good Friday at 12 o'clock, this being the hour that both Catholic and Protestant churches observe as being the time of the crucifixion of Christ. Dean Lee, pastor of the above-mentioned church, has been noted, while in Lexington, for his progressiveness, and the first summer he was located in Lexington he endeavored to have all the churches hold union services at Woodland Park on Sunday nights during the warmest weather, this being the street railway park. As he could not get the other church representatives to agree to this, he inaugurated a series of Sunday night meetings himself, the railway company furnishing the park and auditorium properly illuminated for his benefit.

NOVEL TRANSFER TICKET ON BOSTON & NORTHERN

A new style of transfer has been adopted by the Boston & Northern Street Railway. It is known as "route transfer." The route name—that is, the name of the street—appears in large red letters on the top of the check, and the rule governing the handling of them admonishes the conductors that the checks must not be accepted for passage on the route of issue except in cases where it is absolutely necessary. The proper issue of the new transfer will require but three punch marks—destination, time limit and one for "a. m." or "p. m." If presented on routes other than the one indicated or after the expiration of time limit, the conductor is instructed to call the passenger's attention to the fact and request him to pay his fare. Transfers to destinations reached from transfer points other than Merrimack Square shall only be issued to passengers when leaving the car at said transfer points.

STANDARD TIME FOR INTERURBAN RAILWAYS RADIATING FROM DETROIT

Standard time will go into effect on the local lines of the Detroit United Railway and all suburban roads radiating from Detroit, on May 1. The Detroit United will arrange to have printed upon its tickets information showing the hours they are good under standard time. The company has in stock a large quantity of tickets which designate the time within which they are good by sun time. It is proposed to have these tickets run through the press, and the equivalent time shown for standard time, which, as regards workingmen's tickets, is 5 a. m. to 6:30 a. m. and 4:45 p. m. to 5:45 p. m. Quite a good deal of work, in addition to the time-table work referred to, is required to revise these tickets.

PAINTING PARK BUILDINGS

The opening of the park season brings to mind the wisdom of properly painting the park buildings, for the treatment of such structures with good paint not only enhances their attractiveness but lengthens their life and decreases the painting expenses for later seasons. The Sherwin-Williams Company, which is so well known as a manufacturer of paints and varnishes for electric railway uses, has not failed to study this question carefully, and hence is in position to recommend its standard depot paint as an ideal brand for use on both the interior and exterior of park buildings. It is made of pure materials, mostly of the company's own manufacture, which are all given the most careful chemical tests to be sure that they are up to the company's high standard.

FINANCIAL INTELLIGENCE

Wall Street, April 19, 1905.

The Money Market

The feature of the money market this week was the greater ease displayed in all departments, resulting almost entirely from the comparatively light demand, despite the activity and strength in the local securities market, and from the further accumulation of funds at this center. For the last two weeks the receipts of funds from the interior, on account of subscriptions to the various bond issues, and for other purposes, have been largely in excess of the shipments by the local institutions. In addition the New York banks continue to gain substantially on their operations with the Sub-Treasury, thus materially increasing the supply of lendable funds. The demand for accommodations was confined almost entirely to the call loan department, which was fairly active throughout. At the opening lenders offered only moderately, at 3 to 3¼ per cent, but near the close the rate yielded under liberal offerings to 2½ per cent, the closing rate being 2¾ per cent. In the time loan department business continued extremely quiet. Borrowers generally continued to draw from the open market rather than to make time contracts. The banks and other lenders were more anxious than heretofore to place their funds, and even a general reduction to 3½ per cent for all maturities up to six months failed to stimulate any demand for time loans. The commercial paper market was somewhat less active. Dealers reported a good inquiry both from local and out-of-town sources, but the supply of prime material was limited, indicating that merchants have secured all necessary accommodations for the present. Rates for the choicest names were quoted at 3¾ to 4 per cent, while good names were discounted at 4 to 4¼ per cent. At the close all indications point to a continued easy market, at about the present level of rates. It is true that the local banks will soon be called upon to make heavy payments on account of the various bond issues now pending, besides the payment of upwards of $29,000,000 of Government money between the present time and July 3. It is expected, however, that these payments will be offset by the influx of currency from the interior, and by the arrivals of new gold from the Klondike. Government disbursements are also in excess of the revenues, and the prospects are that they will continue so for the balance of the fiscal year. The bank statement, published on last Saturday, was more favorable than was generally expected. Loans increased $8,851,500. Cash increased $3,570,200, being somewhat larger than was indicated by the preliminary figures. Deposits increased $11,601,300. The reserve required was $2,900,325 larger than in the preceding week. Surplus reserve increased $669,875 to $9,852,400, as against $27,304,600 in 1904, $6,007,650 in 1903, $6,578,650 in 1902, $14,922,100 in 1901, and $14,849,350 in 1900.

The European market continued easy, rates at all the principal centers remaining practically unchanged, except at Paris, where a decline of about ½ per cent to 1 13-16 per cent was reported.

The Stock Market

There was a considerable increase in the volume of business on the Stock Exchange this week, and although prices displayed some irregularity at times, as a result of profit-taking sales, the general trend of values was toward a higher level. At the opening there was some hesitation, there being some apprehension that the selling by the Western element to provide funds to carry on the campaign in wheat would be renewed, and practically all of the early business was transacted by the local traders. The selling from this source, however, failed to materialize.

This fact, together with the heavy purchases by commission houses, and the encouraging reports regarding the industrial situation throughout the country, imparted a decidedly cheerful sentiment. The buying of the various issues assumed much larger proportions, both for local and foreign account, and prices generally advanced sharply. In many instances new high records were established, while in other quarters of the market values rose to within small fractions of the previous high levels. In the early dealings speculation centered largely in the industrial groups, and especially in Amalgamated Copper, American Smelting & Refining, United States Steel preferred, American Locomotive, Tennessee Coal & Iron, and American Woolens. Toward the close of last week prices reacted rather sharply, owing to the usual end of the week profit taking. On Monday the upward movement was resumed. There were no adverse developments over Sunday, and the money market continued to show increasing ease in all its branches. The railroad stocks displayed pronounced strength under the lead of Northern Securities on the "curb," which advanced to 185, the highest price at which the stock has ever sold. Union Pacific advanced sharply on moderate transactions. St. Paul and New York Central also rose sharply on rumor of a deal of some kind resulting from the Northern Securities situation. Reading developed considerable activity and strength. Atlantic Coast Line, Louisville & Nashville, Illinois Central and several of the less important issues displayed pronounced strength. In the industrial list United States Steel preferred made a new high record at 104¾, and Tennessee Coal & Iron reached 105. On Tuesday, however, there was a violent break in Northern Securities of 16 points, which was followed by a rally of 6 points. The slump in this stock was due to uncertainty regarding the position of the stock, resulting from the filing of the United States Supreme Court mandate, and the uncovering of stop loss orders. The break in this stock, together with the heavy selling by Western houses which developed near the close, resulted in sharp reaction, many issues losing from 2 to 5 points. The closing was unsettled.

The local traction issues were comparatively quiet throughout the week. In the early trading Metropolitan Street Railway displayed decided strength, the price rising to 123⅞, on reports of a new alliance with the New York, New Haven & Hartford Railroad. In the subsequent dealings, however, it lost more than the improvement, in sympathy with the reaction in the general market.

Trading in Interborough Rapid Transit stock on the New York "curb" was rather light, but the dealings were accompanied by erratic price changes. From 208½ at the opening the price declined 3⅜ points, but later there was a sharp advance to 212½. In the subsequent dealings support was withdrawn, and the price drifted to 206, which was the closing figure. About 7000 shares were dealt in.

Philadelphia

Increased activity developed in the local market for traction issues this week, and although the trading was attended with more or less irregularity in prices, the general tone was decidedly firm. In the early dealings prices ran off fractionally, but toward the close there were sharp upward movements, which carried prices for some issues to the highest points yet recorded. Philadelphia Rapid Transit was the overshadowing feature of the dealings, both as to activity and strength. From 31¼ the price ran off fractionally, but later on rumor of a "deal" and covering by shorts there was an advance to 36⅛, the closing transaction being made at 36. Nearly 100,000 shares of the stock were traded in. It was rumored that a New York syndicate had offered Mr. Widener 50 for his entire holdings in the company, and that a representative of J. P. Morgan & Co. would go into the board. There was no confirmation of the rumor, however. Another conspicuous feature was the sharp rise in United Gas & Improvement on the extension of the Philadelphia gas works lease. It is said that the new lease will run for fifty years from December 31, 1907, the lessees being as at present, the Equitable Illuminating Gas Light Company, which is owned by the United Gas & Improvement Company. Initial transactions in the stock were made at 116, from which the price receded to 115⅜, but near the close there was a sharp advance to 123⅛. Later there was a reaction to 117½, but in the subsequent dealings the price advanced and closed at 122½. The transactions for the week aggregated nearly 45,000 shares. Philadelphia Company common and preferred were strong, the first named advancing to 47¼ on the exchange of about 2000 shares, while the preferred rose a point to 49 on the purchase of a comparatively small amount of stock. Union Traction advanced to 60⅞, and established a new high record. Philadelphia Electric rose from 11 to 11⅝ on the exchange of about 19,000 shares. Indiana Union Traction sold at from 26 to 27 for small amounts, and Indianapolis Street Railway brought 110⅛ to 110½ for 200 shares. American Railways was steady, a small lot selling at 54¼. Philadelphia Traction was steady, about 1000 shares selling at 100 and 99⅞. Consolidated Traction of New Jersey was reactionary, about 1000 shares being transferred at from 85 to 84. Fairmount Park Transportation was quiet but strong, odd lots selling at prices ranging from 22½ to 23½.

Chicago

Trading in the local street railway issues continued upon an extremely small scale this week, but apart from Chicago Union Traction common, which declined 1½ points to 8½ on the exchange of small amounts, prices held generally firm. One of the strongest features of the market was Union Traction preferred, which, after selling as low as 34, rallied and closed at 37. North Chicago sold from 70 up to 71, while transactions in West Chicago brought 51. In the elevated railway issues trading was also light. Metropolitan common changed hands at from 22¾ to 23, while the preferred brought 61¼ and 61½. Northwestern common sold at 23¼ to 23, and the preferred at 60. Sales of Chicago & Oak Park common were made between 6¼ to 6, and transactions in the preferred were made at 31. South Side sold at 94. Transactions in the bond market included $3,000 Lake Street Elevated 1st 5s at 98½, $7,000 Metropolitan 4s at 90, and $2,000 North Chicago 4½s at 93½ to 92½.

R. R. Govin, of the Union Traction Company, is quoted as saying that not only municipal ownership, but municipal operation of the two great traction systems of Chicago will be an established fact within three months. Mr. Govin also said that the traction interests were desirous of doing everything possible to facilitate acquisition by the city.

Representatives of the various traction companies are to be invited to be present at the next meeting of the transportation committee of the Council and give their views on the plans as outlined by Judge Dunne. Bird S. Coler, ex-Controller of New York City, has offered his services to Mayor Dunne in organizing a syndicate to take Mueller certificates for the purchase of the various railways. These certificates were authorized under the Mueller law, under which the city is authorized to purchase or build street railways, and it is by the sale of these certificates that the city expects to raise the necessary funds for municipal ownership of the street railways.

Other Traction Securities

Interest in the Baltimore traction issues this week centered almost entirely in the United Railway issues, and especially in the income bonds, which displayed considerable activity and weakness. In the early dealings there was rather heavy selling of the income by tired holders, which carried the price down a point to 62, but later pronounced strength developed, the price reaching 64½, on buying by interests said to be identified with the protection committee. The strength, however, was only temporary, and toward the close the price ran off sharply, the final transactions being made at 60½, which was the lowest. Upwards of $180,000 were dealt in. The 4 per cents were also fairly active, about $70,000 changing hands at from 92¾ to 92¼. The stock was extremely dull, about 1000 shares selling at prices ranging from 14½ to 13½. Other transactions included $9,000 Norfolk Railway & Light 5s at 94¾, Virginia Electric Railway & Development 5s at 99, Lexington Street Railway 5s at 104 to 104¾, City & Suburban 5s at 114½, Macon Railway & Light at 99 to 99½, and Augusta Railway & Electric 5s at 105½. The feature of the Boston market was the strength in Boston & Worcester issues on comparatively light transactions. From 32¾ at the opening the common ran off 1¾ points, but quickly rose to 34½, and retained nearly all of the gain, the closing transaction being made at 33⅞. The preferred advanced from 79½ to 80, and after a reaction to 79 it advanced to 82½, and closed a point under the highest. Massachusetts common was steady, with transactions at prices ranging from 21¼ to 22. The preferred, however, was weak, several hundred shares changing hands at from 69 to 68. Boston Elevated was decidedly strong, the price advancing 1½ points from the week's lowest to 156½. The company has sold $7,500,000 4 per cent thirty-year bonds to a syndicate. West End common rose from 97¼ to 98, and closed at 97⅝, while the preferred advanced a point to 117. Other transactions were about 4000 shares of New Orleans Railway common, "when issued," at from 29¼ to 28½, 600 preferred, when issued, at from 77¾ to 77, $40,000 4½ per cent bonds at 92 to 91¾, and $26,000 Washington Railway & Electric 4s at 89½ to 89¼.

Tractions were active in Cincinnati. Toledo Railways & Light featured in the trading, sales aggregating about 1700 shares, with a range of 35¼ to 37. Cincinnati, Newport & Covington common sold to extent of 750 shares, with range of from 30½ to 31½, and the preferred to the extent of 350 shares at from 91¾ to 92½. Detroit United sold at 84½ to 85½. Cincinnati Street Railway sold at 148½ to 149. Cincinnati, Dayton & Toledo was quite active at 20⅛ to 21¼. Toledo, Bowling Green & Southern Traction made its appearance with small sales at 35. Cincinnati, Dayton & Toledo 5 per cent bonds were in strong demand and $110,000 worth changed hands at 90 to 92½, an advance of three points over previous week. Indianapolis Street Railway 4s to the amount of $31,000 sold at 88¾ to 90. Southern Ohio Traction 5s, an underlying issue of C. D. & T., sold at 98 to 98¾ for $1,000 worth.

Orders from Cincinnati caused heavy trading in Cincinnati, Dayton & Toledo issues in Cleveland. The new financing plan and improvements to be made to the property are attracting considerable attention, and prices were about the same as Cincinnati. These issues are rapidly being disposed of by Cleveland holders since the control of the property has left the city. Northern Ohio Traction & Light opened the week at 21 and advanced to 23, but the majority of holders are hanging out for higher prices. Aurora, Elgin & Chicago again came into the trading at 15. Several lots were disposed of at 18. The earnings of the property are improving rapidly, and indicate that the stock is good for an advance. Cleveland Electric declined from 82 to 79, the result of the legal tangle over franchises. The action of Muncie, Hartford & Ft. Wayne in failing to increase dividend rate caused a slight decline in this issue to 50¾, but not much is being offered. Lake Shore Electric common came into trading after six months of inactivity, and buyers paid 10, as against the last sale at 4. The road is showing marked gains in earnings and will have a good surplus for stock this year, whereas last year it failed to earn its bond interest by $18,000. A block of Lake Shore 5s sold at 70 on the exchange, but they were resold immediately outside at 75.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	April 12	April 19
American Railways	54	54
Boston Elevated	155½	156
Brooklyn Rapid Transit	69¾	68½
Chicago City	..	199
Chicago Union Traction (common)	9½	6⅝
Chicago Union Traction (preferred)	37¼	35
Cleveland Electric	81	81
Consolidated Traction of New Jersey	84	84
Consolidated Traction of New Jersey 5s	110¼	110
Detroit United	84	85¾
Interborough Rapid Transit	206	205
International Traction of Buffalo	29	29
International Traction of Buffalo (preferred)	68	68½
International Traction of Buffalo 4s	82½	85
Manhattan Railway	166½	166½
Massachusetts Electric Cos. (common)	21½	20½
Massachusetts Electric Cos. (preferred)	68½	a68
Metropolitan Elevated, Chicago (common)	22½	22½
Metropolitan Elevated, Chicago (preferred)	61	61
Metropolitan Street	122	121⅞
Metropolitan Securities	86½	85⅞
New Orleans Railways (common), W. I	28⅝	27½
New Orleans Railways (preferred), W. I	77¾	76¼
New Orleans Railways, 4½s	91¼	91
North American	101½	105¾
North Jersey Street Railway	25	25
Philadelphia Company (common)	46	46⅞
Philadelphia Rapid Transit	31½	35⅜
Philadelphia Traction	100	99¾
Public Service Corporation 5 per cent notes	97¾	97½
Public Service Corporation certificates	72½	71¼
South Side Elevated (Chicago)	93½	93½
Third Avenue	131¼	129
Twin City, Minneapolis (common)	118	117¼
Union Traction (Philadelphia)	60	61
West End (common)	97½	97¼
West End (preferred)	116	116

a Asked. W. I., when issued.

Iron and Steel

The "Iron Age" says the latest official reports from the Mesaba Range indicate pretty well that the labor situation is well in hand, and there is little danger of a serious interruption in operation. After the long spell of activity in buying in principal pig iron distributing markets, there has been a rather quiet time of it lately. The heavy branches continue active and under full pressure. There is further good booking of steel rail orders. The tonnage coming to bridge shops is exceedingly heavy, both on structural material and on plates. The United States Steel Corporation is forced to pro-rate orders, being able to bid only on a part of the tonnage presented.

REPORT OF UNITED RAILWAYS OF BALTIMORE—RECOVERING FROM THE FIRE

The report of the United Railways Company, of Baltimore, Md., has just been issued. It shows gross earnings of $5,440,942, with net of $2,564,403. The gross earnings are given as $2,574,641. After deducting fixed charges, taxes, interest on floating debt, etc., there was left as net income $330,062. The operating figures follow:

	1904	1903
Gross receipts	$5,440,942	$5,480,629
Operating expenses	2,876,538	*2,978,554
Net earnings	$2,564,403	$2,502,074
Other income	10,238	....
Gross income	$2,574,641	$2,502,074
Fixed charges, taxes, interest on floating debt, etc	b2,244,578	a2,708,029
Net income	$330,062	def. $205,954

* Corrected to include $424,313 spent for reconstructing tracks, but heretofore charged to profit and loss. Revision made by expert Stephen Little, and concurred in by Haskins & Sells and Price, Waterhouse & Company. a-Includes $560,000 interest paid on income bonds. b Does not include interest on income bonds.

Comparing 1904 results with the revised figures for 1903, shows the following: Decrease in earnings, $29,449.17; decrease in operating expenses and maintenance, $102,015.73; increase in fixed charges, $96,549.36; decrease in net results of 1904, as compared with 1903, $23,982.80. Upon this basis there was an increase of twenty-two hundredths of a cent per car mile for 1904, although the operating expenses and maintenance show a decrease. This average increase per car-mile is, however, occasioned by a decrease in miles operated, as some important items of expense do not vary with the amount of service performed. The percentage of operating expenses and maintenance shows a decrease of 1.48 per cent. for 1904 as compared with 1903.

Interest attaches to the report because of the conditions with which the company had to contend as a result of the disastrous fire of Feb. 8, 1904. In the conflagration were destroyed the main power house and all overhead work in the burned section. The tracks in this section were all buried under tons of debris and threatened with miles of tottering walls. The fire disaster came so suddenly and was so overwhelming in its magnitude that the company's operations were for the time completely paralyzed. Besides the losses to business and property directly chargeable to the fire, there were heavy indirect losses, due to irregularities of service caused by the unusual use of streets in connection with their improvement, the removal of fire debris and the prosecution of rebuilding operations. The company really passed through an ordeal without a parallel in rapid transit experience.

The improvements to the property were all carried out with rare judgment. The proceeds of the $4,634,000 bonds set aside for extensions, improvements, etc., were expended almost exclusively in providing necessary shop and power house buildings and their equipment. Many miles of track also were entirely reconstructed. Upon a number of the streets the alignment or grade, or both, was changed by the city in connection with widening and otherwise improving thoroughfares in the burned district. A fifth 3000-hp engine and generator was ordered for the new engine house at Pratt Street May last, and was put in service in December. These five units, together with the three 2500-hp direct-current machines which were restored after the fire, comprise all the generating machinery now at Pratt Street, but, with the 7500-hp unit now being built for that house, will raise the rated capacity to 30,000 hp, and, with the overload that can be carried during the rush hours, will furnish an available output of 40,000 hp, or as much thereof as can be transformed and applied.

The Falls Road power house has been reinforced during the year by the transfer of two 500-hp engines and three boilers, aggregating 1600 hp, from the South Charles Street house, also one 125-kw booster from Druid Hill Avenue power house, an addition being made to the building for the accommodation of this machinery.

Owing to the necessity for utilizing the maximum capacity of the alternating high-voltage machinery at the Pratt Street power house, in connection with supplying current for the operation of lines in the eastern section of the city, and upon the Sparrows Point-Middle River system, a sub-station, for transforming, converting and distributing current to be received through subway cables from the Pratt Street house, is now being erected at the corner of Eastern Avenue and Fifteenth Street, in Baltimore County.

For similar use, in connection with the northern lines of the system (city and county), another sub-station will be established in the northern section. It will be necessary to rush work on this station to prevent interruption of service upon some of the car lines, while the removal of the two large direct-current machines, necessitated by the widening of Pratt Street, is in progress. Before these removals can be made, however, the power house must be rebuilt, and the 7500-hp unit, now under construction, must be installed and put in operation.

As all of the company's direct-current machinery at its main power plant was either destroyed by fire or put out of commission for an indefinite time, it became necessary to substitute upon the extensive feeder system centering at Pratt Street the requisite amount of current from the alternating machinery in the new engine house, which had withstood the fire. In order to do this, however, it was necessary to provide and equip a sub-station in close touch with the feeder system, which was done by utilizing the walls of the old sugar refinery building upon the power house property and stocking it with transformers and converters supplied by the Westinghouse Company upon rush orders. It was due to the serious damage to some, and to the total destruction of other direct-current machinery which supplied power to the eastern section of the city, that that section was deprived for a longer time than others of car facilities.

A complete new equipment of winter cars was arranged for, upon the car trust plan, for the Madison Avenue, North Avenue, Edmondson Avenue and John Street lines, and was received before the close of the year and assigned, respectively, as follows: 35, 40, 40, 35, making a total of 150 cars.

On December 8, 1904, a sale was made to Dominick & Dominick and J. W. Middendorf & Company, of the $2,000,000 of bonds of the Baltimore, Sparrows Point & Chesapeake Railway Company, at 87½ and interest, and the proceeds were applied to the liquidation of its floating debt.

It is estimated that the company's present physical disabilities can be overcome by the following expenditures, distributed over five years:

For reconstruction of 101 miles of track	$1,500,000
For additional cars—150 single-truck cars, 50 double-truck cars with 2-motor equipments, and 40 with 4-motor equipments and air brakes; also 80 summer bodies for double-truck cars	1,000,000
For car houses, including terminal station at Druid Hill Avenue terminus	885,000
For additional facilities at Carroll Park shops	50,000
For rebuilding main power house, providing new 7500-hp engine and generator, with steam and exhaust piping, cable connections, and moving two of the tower engines and generators from the widened bed of Pratt Street	383,000
Additional boiler-house equipment	103,000
Eastern sub-station, with equipment, cable connections, etc.	142,000
Northern sub-station, equipped and connected	145,000
Total	$4,208,000

With no special fund to draw upon for immediate wholesale betterments, the company has been going along with such work in a necessarily conservative way, feeling that it would be nothing short of a calamity to be compelled suddenly to consign to the scrap heap a hundred miles of track, and several hundred cars which are still in condition to perform several years of good service. The substitution of subway cables for 120 miles of overhead lines, and the utilization of 100 miles of material taken down, for repairs outside of the subway district, have placed most of the company's overhead work in good condition; and when it has rebuilt the power house fronting on Pratt Street, installed the new machinery and established the Eastern and Northern sub-stations with cable connections with the Pratt Street house, for all of which, except the Northern sub-station, financial provision has been made, the company's power plant and transmission lines will be in first-class condition.

At the annual meeting of the company the following directors were elected: E. L. Bartlett, H. C. Black, Alex. Brown, B. H. Griswold, Jr., J. M. Hood, George C. Jenkins, Seymour Mandlebaum, H. A. Parr, John B. Ramsey, Douglas H. Thomas and Francis T. Waters.

The advertising representatives of a large number of concerns engaged in the manufacture of machinery and allied industries have formed an organization to be known as the Technical Publicity Association. The first annual meeting, dinner and election of officers will be held in the rooms of the Hardware Club in the Postal Telegraph Building, New York City, on the evening of April 27, when an address will be delivered by E. T. Harris, well known as a broker of trade and technical journals.

CHICAGO TRACTION DEVELOPMENTS

No moves of importance in the direction of municipal ownership were evident during the first week of Mayor Dunne's administration in Chicago. In regard to the invitation extended to Manager Dalrymple, of Glasgow, to act as advisor to the city, the general sentiment of the press seems to be that Glasgow conditions, both physical and legal, are so different from those in Chicago that, however able might be the talent imported from Glasgow, it could not advise Mayor Dunne as well as traction experts of the United States.

Bion J. Arnold and a corps of expert engineers employed by him are at work preparing plans and specifications for a municipal street railway on Adams and other streets occupied by the Chicago Passenger Railway, the franchise of which is claimed to have expired.

John J. Cummings, president of the McGuire-Cummings Manufacturing Company, of Chicago, called on Mayor Dunne last week and expressed the willingness of his company to accept Mueller law certificates in payment for street railway equipment furnished the city, or for a complete municipal railway. He is to submit a proposition later.

THE WORCESTER & PROVIDENCE STREET RAILWAY COMPANY

Horace A. Kimball, Fred L. Sayles, William H. Pendergrast, Fayette E. Bartlett, Fred C. Hinds, Waldo R. Bartlett, John McLaughlin, John P. Meade, Delmont Smith and James McLaughlin were incorporated last week by the Legislature of Rhode Island under the name of the Worcester & Providence Street Railway Company, with a capital stock not to exceed $1,000,000, to be divided into shares of $100 each. Under this act it is contemplated building an electric railway for the transportation of passengers and freight, through the towns of North Providence, Smithfield, North Smithfield and Burrillville, thus connecting Providence with Worcester, Mass. The company is given the right to secure property rights and acquire the stocks and bonds of other corporations, and to make contracts with the Union Railroad Company, of Providence, or other traction companies. The company is required to file an application for location with the several towns on or before Jan. 1, 1906, and then if it fail to complete its lines within eighteen months after privilege is given by town Council, the right of the company to construct such road shall cease.

SUBSIDIES TO INDIANA ELECTRIC LINES HELD ILLEGAL

Judge R. S. Artman of the Boone County Circuit Court, acting as special judge at Frankfort in the Clinton County Circuit Court, in an opinion handed down Monday, April 17, decided that under existing statutes in Indiana no subsidy may be voted to interurban railways. This decision was rendered upon an appeal from the Board of County Commissioners of Clinton County, which had ordered an election to be held May 18 in Perry and Chester Townships to vote subsidies amounting to about $122,000. Objecting taxpayers appealed to the Circuit Court. The suit is the first of the kind, and the decision is one that, if sustained by the higher court, will defeat plans for a number of promising projects.

Judge Artman holds that an interurban street railway is not included, in the word railroad as set out in Sections 5340, 5376 of Burnes' Revised Statutes, under which the proceedings were instituted. In support, he reviews the statutes in reference to the use of the words "railroad," "street railroad," "interurban street railroad" and "interurban railroad." He holds that the legislature has invariably from the time the word "interurban" appears in the statutes, in 1899, distinguished between railroad and interurban street railroad. He cites in particular the Act of 1903, relating to the fencing of interurban railroads, and says the legislature did not consider the word "railroad" as including interurban railroads, or this act would not have been passed, as there was an existing statute in regard to the fencing of steam railroads.

Judge Artman decides that the Act of 1903 is invalid, because it violates that section of the Constitution relative to amended or supplemental acts. He holds that the original law in regard to the voting of subsidies to railroad companies did not include interurban street railway companies, and it does not now include them, unless by virtue of the Act of 1903. It is further held by the court that it is the province of the court, and not the legislature, to construe legislative enactments. The conclusion is that the Act of 1903, in which it is enacted that whenever the word "railroad" occurs in any of the provisions of the statutes concerning the voting of subsidies, it shall be held to include every kind of street railroad, interurban street railroad or suburban street railroad, is invalid. The case will be at once appealed to the Supreme Court.

TRANSIT MATTERS IN NEW YORK

There were any number of important traction developments in New York last week. The three of primary import, however, were the adoption by the Rapid Transit Company of the recommendations made by the Brooklyn Rapid Transit for tunnel routes, the application of the Interborough Rapid Transit Company for two additional tracks on the Second Avenue elevated line, and the announcement of an alliance between the New York City Railway Company and the New York, New Haven & Hartford Railroad concerning the transfer of passengers from the latter road at Willis Avenue to the underground lines proposed to be built by the New York City Railway as a supplement to the existing system.

The suggestions made to the Rapid Transit Company by the Brooklyn Rapid Transit Company regarding routes for the Brooklyn extension were all adopted at a meeting of that body on Tuesday, at which the new routes were incorporated into the proposed system. A new map has been prepared which includes the routes of the company with those previously mapped out. This action by the commission insures a bid from the company.

The situation thus presented is an interesting one. Arrayed against each other for the right to build in Brooklyn are the Brooklyn Rapid Transit and the Interborough Rapid Transit. The former proposes to build in Brooklyn a system that will best conserve the interests of its present lines there, and to extend this system into Manhattan as far as Fourteenth Street. Thus will it invade New York. Figures quoted by President Winter, of the company, are to the effect that more than 25 per cent of the people of Brooklyn doing business in New York would be served by the lines that he proposes to build there. With the system of interchange of traffic that would be possible between the new lines and those now operated, the plan is very attractive. On the other hand, the Interborough Company in invading Brooklyn would furnish a ready and attractive means of communication between its lines in New York and those of the proposed system in Brooklyn. The offer of the New York City Company to bid for new routes, it will be remembered, was only for lines in Manhattan and the Bronx.

On Thursday the Interborough Company submitted its proposal regarding its Second Avenue line. If permission is granted to make the desired change, the running time of express trains between the upper Bronx and the City Hall will be reduced 12 minues. The proposed improvements in general terms consist of adding two overhead tracks to the Manhattan Railway in the Bronx district, from 150th Street to the Harlem River, adding two overhead tracks to the bridge across the Harlem River, and continuing such overhead tracks to 122d Street, where they will reach the present grade of the elevated structure. From 122d Street, south to First Avenue and Third Street, there will be four tracks at the present grade of the Manhattan Railway, the center tracks rising at the points where there will be express train stations. Only three stops will be made —125th Street, Eighty-sixth and Forty-Second Street. At First Avenue and Third Street it is proposed that the center tracks, to be used for express purposes, shall descend and enter a tunnel, which is to be placed in private property to terminate at West and Chambers Streets in a loop. Action on this matter was postponed by the board.

On Friday it was announced that an alliance had been arranged between New York City Railway interests and the New York, New Haven & Hartford Railroad concerning mutual use of the former's proposed subways. The statement of the alliance was made by John B. McDonald as the representative of the New York City Railway Company before the transit commission. The plan includes the transfer of passengers from New Haven trains at Willis Avenue so that they can take the New York City Company's subway, if constructed, and thus run into the heart of the city with the privilege of transferring to any of the surface lines of the New York City Company.

For some time the New Haven road has been engaged in six-tracking its road from New Rochelle to the Willis Avenue station. The plans of the New York City Company for its proposed subway have been so arranged that its proposed Third Avenue line, or the proposed Lexington Avenue line, or both, would tap the Willis Avenue station and take passengers from the railroad. This would give the New Haven Railroad an inlet to the heart of the city without running over the tracks of the New York Central Railroad into the Grand Central Station as now.

A statement in no way official is to the effect that New York City interests also have been negotiating with the New York Central Railroad with a view of arranging possible subway connections with the Central's King's Bridge station, so as to relieve that road of some of its suburban traffic congestion.

FRANCHISE CONTROVERSY WAXES WARM IN CLEVELAND

The statement made in court last week by attorneys for the Cleveland Electric Railway that the company claimed perpetual franchises over certain routes created a tremendous furor in Cleveland, and the newspapers of that city have since been filled with interviews and open letters made by leaders in the different factions to the controversy.

President Horace Andrews, of the company, stated that the claims for perpetual franchises were a surprise to him, as he said he had never read the early franchises. He stated that the company stood ready, no matter what the decision of the court might be in the case in question, to surrender all its present rights, whether perpetual or not, in return for a new limited contract covering all the lines. He charged that the city administration was doing everything possible to hamper and restrict the company from developing its property, and stated that the administration sought to grant to another company, headed by Charles P. Salen, Mayor Johnson's right-hand man, the company's rights on certain routes. He stated that the company desired to make many improvements in the way of building subway terminals and cross-town lines, and requested that the Chamber of Commerce, or some other non-political body, take up the franchise question and propose an equitable basis for settlement. Meanwhile the Chamber of Commerce appointed a committee of seven very prominent business men to consider ways and means for building subways, and it has been suggested that the duties of this committee be extended to cover the entire franchise question.

The "Cleveland Leader," commenting editorially upon the situation, says that since the Johnson régime, the political question has so entered into the franchise controversy as to color all discussion, and in many instances to confuse the minds of the public as to its rights and wrongs. It strongly commends Mr. Andrews' position as being fair minded, and urges that the Chamber of Commerce committee take up the problem and adjust it, adding that the committee should not accept the statements of Mayor Johnson and his interested adherents at their face value.

Mayor Johnson has vetoed the Council's consent for city property for the construction of a cross-town railway on Woodland Hills Avenue, this consent being necessary to give the company a majority of foot frontage. At the last Council meeting the City Solicitor advised that the Council refrain from granting the cross-town ordinance or any other street railway ordinance until the present controversy over perpetual franchises had been settled.

Both Mayor Johnson and City Clerk Charles P. Salen denied that the latter was in any way interested in the Citizens' Street Railway, the so-called 3-cent fare company.

On Tuesday of this week President Andrews, over his signature, charged that Charles P. Salen had borrowed $10,000 and given his note for same, and had deposited that amount with a bid for the construction of a 3-cent fare line on Denison Avenue, same being tendered under the name of A. E. Green. He also charged that Mayor Johnson knew this loan was made and that the proceeds were used for the purpose stated.

SCHENECTADY COMMON COUNCIL POSTPONES CONSIDERATION OF PROPOSED INTERURBAN UNION TERMINAL

A few weeks ago the New York Central Railroad and the Schenectady Railway Company submitted plans to the Schenectady Common Council providing for the construction of a union station for the interurban lines entering Schenectady, with the two fold object of doing away with the present dangerous grade crossings with the New York Central and the Delaware & Hudson tracks and providing for better means of transporting passenger traffic between the steam and electric lines. The plans contemplated building the station on the block bounded by State, Wall, Union and Center Streets, and the grade crossing with the steam tracks was to be eliminated by lowering the grade of State Street sufficiently to permit the interurban cars to pass under the steam tracks. Such a station is imperatively needed in Schenectady, and as the railway companies offered to pay their just share of the cost of changing the grades, it was believed that the plans would go through without a hitch. Unfortunately the Schenectady aldermen made a party issue of the matter, with the result that both the Democrats and Republicans prepared separate ordinances. These were brought up for action on April 13, but neither of them was passed. Even if one of these ordinances goes through, it is doubtful whether the railway companies will accept it without some amendment, owing to the burdensome conditions imposed upon them.

LOW-FARE PROPOSAL FOR DETROIT MISUNDERSTOOD

A proposal has been made to the City Council of Detroit by the Detroit United Railway Company for a 3-cent fare on special lines. It is proposed by the company to convert the lines on Brush and Beaubien Streets into one line, and to consolidate the line on Hastings Street with a new one to be built on Russell and Rivard Streets, and to have both lines operate under the Detroit Railway 3-cent fare ordinance, which has 19 years yet to run.

This proposal, it seems, was generally misunderstood. The public interpreted it to mean an offer from the company that presaged a general reduction in fare for the entire system, and it even was so construed by the daily press. As a result there was considerable confusion when President Hutchins appeared before the Council committee on franchises last Thursday. He then told how the proposal had been made to meet the wishes of local interests, and just how it was planned to operate the lines. Mr. Hutchins proposed to the Council committee that a commission of patriotic, honest and able men be appointed to investigate the local street railway situation in a thorough and conscientious manner and make recommendations to the city and the street railway company of plans for a fair settlement of the problems involved.

AN INCREASE IN FARE IS JUSTIFIED BY THE MASSACHUSETTS RAILROAD COMMISSIONERS

The Railroad Commissioners of Massachusetts have rendered an interesting decision in the complaint of the selectmen of North Brookfield, that the 6-cent fare on the Warren, Brookfield & Spencer Street Railway is excessive, and that the change from the 5-cent fare violates a condition of the location granted to the company. The board made a thorough examination of the company, its burdens and obligations, and its ability to continue serving the public at the old rate. The conclusion is that, under existing conditions, the railway company has acted reasonably, and that its charge is not excessive. It could not live and give the public the accommodations it needs at the old rate of fare. Therefore, the conclusion is reached that, "when fares prove to be too low to make an enterprise fairly profitable, it is better for all concerned that the company revise its rates and place them upon a footing which will enable it to give the accommodation which the public needs, and make a just return to stockholders upon their honest investment. The decision follows in part:

For the past three years this company has paid no dividends, net earnings having been applied toward the payment of floating indebtedness which the company was unable to capitalize inasmuch as no one was willing to take the stock at par. If these earnings had been devoted to the repairs and renewal of property, to which they might well have been devoted, there would have been little or nothing left for payment of either floating indebtedness or dividends. Among other things, the removal of a large industry from North Brookfield has affected the business of the company. It is evident that if the public is to be given suitable accommodation and at the same time operating expenses are to be met, the property maintained and even a small return made to stockholders, the present fare is not excessive. The chief contention of the complainants is that the change from a 5-cent to a 6-cent fare violates a condition of the location. The Supreme Court has held that such a condition has not the binding force of a contract, and that notwithstanding the acceptance of the location a company is free to establish what it deems to be proper charges, subject to the jurisdiction of this board over the reasonableness of such charges.

The only question before the board is, then, whether the fare of which complaint is made is reasonable. It would be plainly unjust to declare a fare reasonable which is so low as to lead to the bankruptcy of a company through the gradual exhaustion of its assets. On the other hand, promoters of an enterprise who have promised to maintain a stated fare, as an inducement for a grant of location, are bound to make a thorough attempt to carry out the promise, though this attempt may mean a sacrifice of dividends and even some risk to capital. But a railway company with such a promise upon its hands is hardly in the attitude of a private debtor. It has undertaken to be a public agent, and the paramount question is in what way it can efficiently perform this service. No company which is held to a fare that will bankrupt it can give the public the accommodation which it needs.

Under our statutes the boards which grant locations can revoke them, and if a location has been secured upon false pretenses, it may be eminently proper that it be revoked; but ordinarily there is little satisfaction to the public in losing the railway, little justice in destroying the property of the stockholders and no opportunity to restore parties to their original condition. Usually, when fares prove to be too low to make an enterprise fairly profitable, it is better for all concerned that the company revise its rates and place them upon a footing which will enable it to give the accommodation which the public needs and make a just return to stockholders upon their honest investment.

Upon a review of all the facts in this case, we find no ground upon which we can hold that the fares now in force upon this railway are unreasonable.

LANSING & JACKSON RAILWAY PLACES CONTRACTS

The Lansing & Jackson Railway Company, Michigan, represented by Myron W. Mills, Geo. G. Moore and Jas. R. Elliott, has closed a contract with the L. E. Myers Company, of Chicago, to build and equip a high-speed heavy duty interurban electric railway connecting Jackson and Lansing, Michigan.

Lansing is the capital of Michigan, with a population of approximately 25,000, while Jackson has a population of 30,000. There are several intermediate towns and villages, all active, growing municipalities. This line when completed will connect with the Lansing, St. Johns & St. Louis road at Lansing, giving a continuous line in a northerly direction from Jackson to St. Johns of approximately 60 miles. The new line will also connect with the Detroit, Ypsilanti & Ann Arbor Railway at Jackson, giving a continuous line from St. Johns to Detroit via Lansing. It will also connect with the Jackson & Battle Creek Electric Railway.

The roadbed is to be constructed in conformity with the Pennsylvania Railroad practice, using 70-lb. regular T-rail, continuous rail joints, white oak ties, following Pennsylvania standard, and ballasting with 18 ins. of gravel. All water openings and culverts will be cast-iron pipe or concrete construction. The bridges will all be of steel, built to sustain a rolling load of 5000 pounds per lineal foot. The overhead construction will be modern and of the highest possible grade, employing 40-ft. 8-in. top cedar polls. For the trolley, there will be employed 2 No. 0000 B. & S. wires, drawn to conform to a special design of the L. E. Myers Company, with necessary a. c. and d. c. feeders. The cars will be of the most modern design, weighing equipped about 30 tons, making a maximum speed of 45 to 50 miles with a schedule speed of 35 miles per hour.

There will be two sub-stations located at intermediate towns. These sub-stations will be designed to meet all the requirements for accommodation of the electrical machinery, and at the same time serve as offices and depots. The railway company will be represented on the work by T. M. Keeley, its chief and consulting engineer. The work of the L. E. Myers Company will be under the personal supervision and direction of C. E. Collins, its general superintendent.

ORGANIZATION OF THE C. H. WHEELER CONDENSER & PUMP COMPANY

The announcement is made that the Barr Pump Company, of Philadelphia, has been taken over by a new company to be known as the C. H. Wheeler Condenser & Pump Company. C. H. Wheeler, the former president and general manager of the Wheeler Condenser & Engineering Company, is now solely identified with the new company. The personal services of Mr. Wheeler, ample capital, modernly-equipped works and an up-to-date engineering staff, place the company in a position of unusual strength on condensing apparatus and pumps of any size and description for all purposes where such machinery is required. These will include surface, jet and barometric condensers; electric, geared, or steam-driven vacuum and circulating pumps; water-cooling towers; pumping engines and all auxiliaries for complete plants for both stationary and marine service, including the highest vacuum guarantees for turbine requirements. The company's principal office is in Philadelphia, at Lehigh Avenue and Eighteenth Street, with a New York branch at 26 Cortlandt Street. Additional branches in Chicago and other large cities will soon be established. The officers of the company are as follows: President, John Pitcairn, who is also the president of the Pittsburg Plate Glass Company, Pittsburg, Pa.; vice-president, George Burnham, Jr., of the Baldwin Locomotive Works, of Philadelphia; secretary and general manager, C. H. Wheeler; works manager, Otto W. Schaum, of Schaum & Uhlinger, Philadelphia; treasurer, W. H. Rometsch, of the Fletcher Works, Philadelphia.

REMOVAL OF AMERICAN STEEL FOUNDRIES

The executive offices of the American Steel Foundries until lately were located at 74 Broadway, New York. With the object of concentrating all of the departments of this well-known concern it was found necessary to lease the entire eleventh floor of the recently completed building known as 42 Broadway. It is well known that in the new movement towards consolidation of allied industries, one of the chief elements of success involves the systematizing and harmonizing of every branch of the business. With this end in view the executive offices of the American Steel Foundries are inaugurating, simultaneously with the removal, a new system of accounting and distribution of orders, which will improve the organization and simplify their work. This will assist them in taking care of the many large orders they are receiving, due to the increased demand for new equipment by the railroads and other large users. The output of their eight plants for all kinds of steel castings is enormous, and they are always in a position to undertake new work and make prompt deliveries. With the acquisition of the Simplex Railway Appliance Company they are even better equipped than ever to fill the requirements of railroad companies and car builders.

NO CHANGE IN SAN FRANCISCO PROPERTY

Referring to the report that Brown Brothers & Company have decided to relinquish the control and management of the United Railroads of San Francisco, that firm states that it has no intention whatever of retiring from the management of the property. Ladenburg, Thalman & Company, of New York, to whom it was reported that control would pass, have long had a very large interest in the United Railways Investment Company, of San Francosco, (the holding company) and have been and are in entire accord with the present management.

REPORT OF THE LIVERPOOL CORPORATION TRAMWAYS

The report of the Liverpool Corporation Tramways for the year ending Dec. 31, 1904, has just been published. It is uniform in size and completeness with the previous reports of the same system, and contains 79 pages, five large diagrams showing graphically the development of the system and other statistics, and a large map. The principal figures follow:

	1904	1903	1902
Capital investment	£1,916,257	£1,832,977	£1,863,485
Gross receipts	557,888	517,935	531,483
Operating expenses	367,845	339.810	341,463
Operating ratio	65.9%	65%	64.247%
Gross profits	£190,043	£178,124	£203,256
Interest and sinking fund	108 117	102,627	107,014
Balance	81,326	75,497	96,242
Divided as follows:			
Reserve, renewal and depreciation	54,217	50,331	64,161
Transferred to general rate account	27,108	25,165	32,080
Operating expenses per car mile	7.256d	6.884d.	6.983d.
Gross earnings per car mile	10.67d.	10.34d.	10.733d.
Average fare per passenger	1.112d.	1.111d.	1.113d.
Average length of penny stage	2 m., 671 yds.	2⅓ miles	2⅓ miles
Passengers carried	116,642,663	113,015,728	108,906,472
Cost of power	£94,937	£80.956	£82,752
Price paid for power per kw-hour	1.159d.	1.098d.	1.2d.

NEW YORK FRANCHISE CASE BEFORE SUPREME COURT

Argument is being heard this week before the United States Supreme Court in the special franchise tax cases from New York. The hearing was begun on Monday, and the first to present argument was W. D. Guthrie, of New York, who appeared especially for the New York City Railway Company. As the cases were not called until a few moments before adjournment, Mr. Guthrie had not time to do more than introduce his subject. Mr. Guthrie concluded his argument on Tuesday. He dealt mainly with two contentions: That the law impairs the obligation of contracts under which the corporations acquired and own their franchises, and that it operates to deny them due process of law. Speaking of the law as an "experiment in legislation" in the way of taxing franchises for what are comprehensively termed public utilities, such as transportation, gas, electric lights, telephones, etc., he said:

"It is of great concern and interest to State governments and to corporations similarly situated that this court shall indicate whether existing contracts granting such franchises are protected against impairment by this new form of subsequent legislation, and whether such legislation must tax all owners of franchises engaged in substantially the same business, and under substantially the same conditions, with equality as far as practicable.

"If the present statute is upheld, it undoubtedly will be followed by similar legislation in every State, and if it impairs existing contracts and embodies unjust and discriminating provisions, it ought not to be permitted to become a precedent, when an amendment of the statute can easily obviate the objections."

He dwelt upon the fact that the New York street car companies had been paying regular taxes on their property, real and personal, and contended for this method of taxation as opposed to a tax on franchises. He quoted the message of Gov. Roosevelt, delivered at the time the bill was before the Legislature, to show that the measure was in some particulars unsatisfactory to him.

Attorney-General Mayer, following Mr. Guthrie, spoke in support of the law. Taking up the contention that the charters of the various corporations are in the nature of a contract relieving them from taxation, he recited many details bearing upon the enactment of the legislation.

HARTFORD SYSTEM FORMALLY TRANSFERRED TO THE NEW HAVEN

The control of the Hartford Street Railway Company was formally transferred on Saturday, April 15, to the Consolidated Railway Company, the holding corporation for the electric railway properties of the New York, New Haven & Hartford Railroad. At a meeting held in Hartford, directors were chosen as follows: Charles S. Mellen and George J. Brush, of New Haven; Charles F. Brooker, of Ansonia; F. W. Cheney, of South Manchester; D. Newton Barney, of Farmington, and Edwin Milner, of Moosup, all directors of the Consolidated Railway Company and the New York, New Haven & Hartford, and D. S. Goodrich, president of the Hartford Street Railway Company; Daniel R. Howe and S. G. Dunham, of Hartford, both directors of the Hartford Street Railway. C. S. Mellen was elected president; Calvert Townley, first vice-president; H. M. Kochersperger, second vice-president; A. S. May, treasurer, and John G. Parker, secretary, all officers of the New York, New Haven & Hartford Company.

LOW FARE BILLS IN MICHIGAN

Three bills were introduced in the Michigan Legislature on Wednesday, April 12, aimed to give municipalities power over public utility corporations. One is a bill to fix street car fares; the second to confer on boards of supervisors power to fix and prescribe reasonable fares, rates and tolls to be charged by corporations, or persons engaged in the street railway, gas, water supply, telephone or electric lighting business, or public service within their several counties; and the third confers the same power on cities.

The first bill provides that in cities having a population of more than 300,000, the highest rate of fare for a ride from one point in the city to another, including the right to transfer, shall not exceed 3 cents, and on a payment of 5 cents the passenger shall be entitled to a return ticket, including transfer.

In cities having a population of more than 100,000 the maximum fare for a ride from one point to another shall not exceed 3 cents; in cities having a population of more than 50,000, the maximum fare shall not exceed 4 cents; in cities having less than 50,000, and in townships, including the incorporated villages therein, the maximum fare for a ride from one point of the township to another over the same road shall not exceed 5 cents. On suburban lines running into or through more than one city or township, the rate of fare from one city or township into another for the first six miles, or fraction thereof, shall not be more than 5 cents, and for each additional mile or fraction, 1 cent, but the aggregate rate shall not be more than 1 cent a mile. Any railroad violating the provisions of the proposed law for 30 days or more shall forfeit its franchise.

The act is to apply to all railway corporations heretofore organized, and it is intended to supplement any grants made by townships, cities or villages.

THE RIGHT OF STEAM ROADS TO PURCHASE ELECTRICS IN MASSACHUSETTS

There is pending before the Massachusetts Legislature a bill to permit railroads incorporated under the State laws to buy street railways. The measure is known as Senate bill 280. The first section of it was reported unanimously by the railroad committee, after consideration of the railroad commissioners' recommendations. Later there was incorporated in the bill a second section, this upon motion of Senator Peters. Considerable opposition to the measure has developed. One of the bodies opposed to it is the Massachusetts State Board of Trade, which has formally protested through its committee on transportation and legislation.

It is generally understood that the bill was introduced in the interest of the Boston & Maine Railroad, which is organized under the laws of Massachusetts and therefore is prevented from effecting the purchase of street railway properties. The Boston & Maine does not see the equity of the law, and so questions the right of foreign corporations to buy Massachusetts street railway properties. Others seem also to be of the same opinion. On Thursday, April 13, at the instance of Mr. Luce, of Somerville, an inquiry was begun to determine the rights of foreign and domestic corporations. This order requests of the attorney-general his opinion as to whether railroad corporations incorporated in other States can legally, under the statutes of Massachusetts, purchase Massachusetts street railway property. Representative Walker, of Brookline, has served notice of his intention to offer an amendment to the bill under which the amount of stock to be issued by the railroads in payment for the stock of street railways shall be left to the railroad commissioners.

GASOLINE CARS FOR ALTON'S SUBURBAN SERVICE

The Chicago & Alton Railroad Company has contracted for six gasoline motor cars, to be used in the interurban service which was established recently, of which mention was made in the Street Railway Journal of April 1, 1905. Small steam engines, hauling ordinary passenger coaches, are now used. The Alton's interurban service was designed to meet the competition of electric lines now paralleling it and others under construction or projected. The first interurban trains were put in service between Pontiac and Bloomington, a distance of 35 miles, and between Springfield and Girard, 25 miles. The Alton's trains are run as frequently and at as low rates of fares as the electric lines. Stops are made not only at all regular stations of the company, but at all highway crossings and public institutions en route, either to take on or let off passengers.

NEW PUBLICATIONS

The Field Practice of Railway Location, by Willard Beahan; Engineering News Publishing Company; 270 pages. Price, $3.

This treatise, by a division engineer of the Chicago & Northwestern Railway, records the methods commonly used in locating the great trans-continental railways in this country. The experience thus derived was unique, and should be of great assistance to those who have to do similar work, although on a much smaller scale, in a sparsely settled country. The book includes chapters on the locomotive, and on train resistance as well as discussing the subject of location.

Steam Turbines, with an Appendix on Gas Turbines, and the Future of Heat Engines, by Dr. A. Stodola; translated from the second German edition by Dr. L. C. Loewenstein; D. Van Nostrand & Company, New York; 434 pages. Price, $4.50.

The popularity of Dr. Stodola's book is shown by the fact that in spite of recent character of engineering interest in steam turbines the German book has passed through two editions. The work is divided into five parts. In the first the principles peculiar to the turbines are discussed. In the second are found thermodynamic investigations requiring more advanced mathematical preparation. The third is devoted to a discussion of the most important turbine parts, and here especial attention is given to the form of blade. The fourth contains descriptions of the principal turbines now on the market, while in the fifth the author considers several special problems of steam turbine theory and construction. The future of the heat engine is taken up in the appendix, where a short discussion is published of the theory and principles of the gas turbine.

State and Territorial General Statutes Relating to the Use of Streets and Highways by Street Railway, Gas, Water and Electric Light Companies, compiled by James S. Cummins; 268 pages. Published by H. M. Byllesby & Company, Chicago.

This is a ready reference book giving the general statutes of the various States and territories, governing the subject of franchise rights, and includes as well such extracts from the State and territorial constitutions as relate particularly to this subject. The author is general counsel for the firm of engineers which publishes the book, and has had a practice of some fifteen years in connection with the incorporation of public service corporations, and passing upon their franchise rights. Although no attempt is made to summarize any municipal ordinances, which of course affect public franchise corporations quite as intimately as do State laws, the volume should prove most valuable in determining the validity of State franchises, and convenient to those who wish to make a preliminary investigation of an existing or proposed franchise in any particular State. In fact, it is the only recent work of the kind with which we are acquainted. The value of a book of this kind depends, of course, largely upon the thoroughness with which it has been brought up to date, and while no statement directly bearing upon this subject is published we notice that in several cases statutes appear which were passed during the sessions of the legislatures of different States during the season 1903-04. It would be useful in any future edition of the book to record under the name of each State the date up to which the laws have been corrected. It is the intention of the author to follow the book by a subsequent treatise covering the principal decisions in the franchise litigations which have arisen in recent years, and to discuss their bearing on the general subject.

EXTENSION OF ALLIS-CHALMERS PLANT

The Allis-Chalmers Company has decided to begin immediately a three million-dollar extension to its Milwaukee works for the manufacture of electrical machinery, and for the construction of steam turbines, hydraulic turbines and gas engines. Three large buildings will be erected, and two of the existing buildings extended. The electrical department at Milwaukee will be operated in connection with the plant of the Bullock Electric Manufacturing Company, of Cincinnati, which is owned by the Allis-Chalmers Company. These unique facilities will provide in the West what will undoubtedly be one of the largest engineering establishments in the world, and the first to concentrate under one organization the design and construction of steam electric units, turbine and reciprocating, on a large scale, as well as hydraulic electric units.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED APRIL 11, 1905

786,795. Trolley Wheel; Edwin W. Clark, Columbus, Ga. App. filed July 28, 1904. The tread of the wheel consists of a drum upon which the flanges of the wheel are adapted to move toward and away from each other under spring tension.

786,832. Trolley Wire Guide; Stewart P. McMullen, Sioux City, Iowa. App. filed June 4, 1904. Details.

786,874. Elevated Railroad; John Cooper, Mount Vernon, Ohio. App. filed Dec. 21, 1904. An elevated railway comprising single supporting posts carrying upper and lower cross-beams, overhead trucks and wheels supporting the car, and suspended from the upper cross-beam, a safety track mounted upon the lower cross-beam, and a safety wheel carried by the car in juxtaposition to the safety rail.

786,887. Trolley Device; Anton F. Flierboom, Elizabeth, N. J. App. filed Jan. 28, 1905. Details of construction.

786,988. Street Car Register Protector; Eflix Paduveri, San Francisco, Cal. App. filed June 8, 1904. Provides auxiliary mechanism for use in "combination" cars to indicate visibly and audibly in all parts of the car to the recording of fares.

786,989. Compound Geared Brake Spindle and Ratchet Handle; Louis Pfingst, New Dorchester, Mass. App. filed Dec. 9, 1903. Details of a brake spindle and ratchet brake lever.

787,033. Trolley Stand; Boniface A. Grasberger, Richmond, Va. App. filed Jan. 23, 1904. Details.

787,034. Trolley Stand; Boniface A. Grasberger, Richmond, Va. App. filed Feb. 9, 1905. Means whereby the pole is automatically lowered when the wheel leaves the wire.

787,035. Trolley Stand; Julius A. Grasberger, Richmond, Va. App. filed Sept. 10, 1904. A modification of the preceding invention.

787,036. Trolley Stand; Julius A. Grasberger, Richmond, Va. App. filed Jan. 20, 1905. Details.

787,051. Wheel Fender; Thomas H. Quinn, Cleveland, Ohio. App. filed Dec. 17, 1904. A supporting hanger for the fender and means constructed to be actuated both by impact with an object on the track, and by a person on the car, to release the hangers and drop the fender.

787,079. Brake Shoe; Frank P. Collier, Wilmette, Ill. App. filed Feb. 6, 1905. A brake-shoe having an attaching-lug and plates at the back of the shoe, between said lug and each end of the shoe.

787,092. Method of Making Brake Shoes; Joseph D. Gallagher, Glenridge, N. J. App. filed Feb. 24, 1903. A method of making brake shoes consisting in providing a body portion consisting of a brake shoe partly worn in service, with retaining devices, and casting thereon a separate wearing sole.

787,151. Brake; Francois Davignon, Schenectady, N. Y. App. filed Dec. 30, 1904. A combined wheel and track brake consisting of a brake shoe adapted to bear against the wheel of the vehicle, and a shoe adapted to bear against the rail of the track, pivoted arms connecting with the operating mechanism, and turnbuckles pivotally connecting the several brake shoes and pivotally connecting with the pivoted arms.

787,169. Trolley Catcher and Retriever; Charles E. Gierding, Newark, N. J. App. filed July 7, 1904. Details of a spring, drum and pawl and ratchet.

787,343. Wire Replacer for Trolleys; William Peck, Steubenville, Ohio. App. filed Dec. 13, 1904. Details.

PERSONAL MENTION

MR. W. J. CLARK, of the railway department of the General Electric Company, has been appointed by President Roosevelt an official delegate to represent the Government at the coming International Railway Congress in Washington next month.

MR. FRANK J. DUFFY has resigned as secretary and treasurer of the Beaumont Traction Company, of Beaumont, Tex., to become general manager of the Vicksburg Railway & Light Company, of Vicksburg, Miss., which operates the street railway and lighting systems of that city.

MR. CARL WILCOXSON, trainmaster of the Western Ohio Railway, has been appointed general superintendent to succeed his father, Mr. C. N. Wilcoxson, who recently resigned to become general superintendent of the Cleveland & Southwestern Traction Company, of Cleveland, Ohio.

MR. CLARENCE S. DARROW has been appointed by Mayor E. F. Dunne, of Chicago, to have charge of traction litigation in the city of Chicago, under the present administration. He succeeds Mr. Edwin Burritt Smith, who has heretofore been acting as special counsel for the city law department and local transportation committee.

MR. M. E. NASH, division superintendent at Marlboro, of the Boston & Worcester Street Railway Company, has been appointed to the position of assistant general superintendent. Mr. H. W. McKay, formerly superintendent of the Haverhill division of the Boston & Northern Street Railway Company, but for several months past in the employ of the Boston & Worcester Street Railway Company, has been appointed to succeed Mr. Nash as superintendent of the Marlboro division.

MR. GEO. E. PRATT, long and favorably known in car building lines in the street railway trade, has resigned from the Star Brass Works, of Kalamazoo, and has accepted a position in the Hicks Locomotive & Car Works, of Chicago. This company is a large manufacturer of steam railroad cars and locomotives, and built the body of the gasoline car for the St. Joseph Valley Railroad, described in the issue of this paper for April 8. The association of Mr. Pratt with the company gives credence to the report that the company is about to engage in the manufacture of electric cars.

MR. P. A. B. WIDENER, of Philadelphia, who is heavily interested in traction properties in Ohio and Indiana, has resigned as a director of the Cincinnati Traction Company; this action being due, it is said, to ill health and inability to attend meetings. He is succeeded on the board by Mr. Dana Stevens, second vice-president of the company, who has also assumed the title of general manager. Heretofore Mr. Stevens has been assistant general manager. Mr. William McAllister's title has been changed from treasurer to comptroller, and Mr. A. L. Kasemeier has been elected treasurer of the company.

MR. M. H. BRONSDON has been appointed to the position of chief engineer of the United Railroads of San Francisco, Cal., to succeed Mr. A. Wolff, who recently resigned. Mr. Bronsdon was connected with the Old Colony Street Railway Company of Boston. His railway career was begun in the West. He was a machinist and blacksmith on the Los Angeles cable roads as a young man. Subsequently, in 1889, he became superintendent and master mechanic of one of the Denver street railways, and later accepted a similar position with the Providence, R. I., Cable Tramway. He became connected with the Old Colony Company in May, of last year.

MR. W. S. MURRAY has been appointed electrical engineer of the New York, New Haven & Hartford Railroad, with headquarters at New Haven. Mr. Murray is a graduate of Lehigh University, and has had a wide experience in electric railroading and long-distance power transmission work. For a number of years he was connected with the Westinghouse interest, but for several years past has been engaged in independent consulting engineering, with offices in the Exchange Building, Boston. A number of important high-voltage power transmission installations for the International Paper Company, S. D. Warren & Company, and other prominent New England concerns, have been carried out under his direction. The appointment is one of the most important that has been made for some time. There will come under Mr. Murray's supervision the lines of the New Haven already converted to electricity, and the electric railway properties taken over by the company, which now aggregate about 500 miles of line. There will also be entrusted to him the solution of problems arising in connection with the electrification of the lines of the company running into the New York terminal. Mr. Murray's father is a prominent officer of the U. S. Navy.

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NOTICE TO ADVERTISERS
Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 8000 copies are printed. Total circulation for 1905, to date, 139,550 copies—an average of 8209 copies per week.

The Iowa Convention

The Iowa street and interurban railway men, while not numerous, demonstrated last week their ability to hold an active, pleasant and profitable convention. Iowa is essentially an agricultural State, in fact the greatest agricultural State of the Union, if we accept the census figures. It has few large centers, but a great many small ones. City railway systems are not numerous and interurban building has only begun. The interurban lines built in Iowa must depend more on freight and less on passenger traffic than in Eastern States, a fact which was well brought out in one of the papers at the convention in connection with others bearing upon Iowa local conditions.

State conventions are coming to figure more and more in the electric railway progress of the country. They attract attendance from many small companies that never are represented at American Street Railway Association meetings, and this must always be the case. While the national body may and should attempt to cater to the small companies as well as the large, it will doubtless always be true that the national conventions will be attended mainly by representatives of the larger corporations, which can afford to send men long distances and which cannot get an exchange of experience with other large companies without attending national conventions. Discussions in State conventions are always more informal than in national, and for that reason more likely to bring out valuable points as to details of operation which are not matters of common knowledge.

Rural Railways

The paper read by Mr. McDonald before the Iowa Street and Interurban Railway Association at its recent meeting describes conditions which exist generally throughout the States of Illinois and Iowa and those adjacent to them. This is the first time, we believe, that these conditions have been stated so fully and so clearly. Iowa farm land is very productive, but the population per square mile is as yet so low that, according to the standards that Eastern engineers have set up, the tributary population on few of the roads that have been built in Iowa is sufficient to justify the building of a road. There is every reason to believe, however, that in judging the merits of interurban and rural projects in Iowa, different standards must be adopted from those used in forming an opinion on projects in States further east. As can be seen from the conditions Mr. McDonald describes, it is necessary to figure on a much larger proportion of the total business, including freight, than in less productive States. As the farms are large and the rural population small as compared to Ohio and Indiana, the passenger business depends rather on the frequent riding of a few than on the infrequent riding of many. Some of the roads already built in Iowa give surprising figures in gross earnings per capita of population, due partly to freight traffic and partly to the prosperity of Iowa farmers. Although there are few farmers per square mile, they are better able to spend money in travel than are the owners of smaller farms in Eastern States. At the present time Iowa is crossed and recrossed with networks of projected interurban roads, but few of them have been built. Numerous promoters have been in the field who know nothing about the business and have but little idea as to the cost and necessary earnings of interurban railways. Leaving these aside, however, there are many railway men who understand the situation in Iowa and are quietly at work securing rights of way for roads which they do not expect to build immediately, but which they feel confident can be financed in the course of a few years after the resources of the Iowa farming country are better understood by investors. Mr. McDonald, in his paper, makes a distinction between an interurban road connecting two large centers of population and a rural railway. The centers of population in Iowa, however, are so far apart that almost every interurban road that has been built really comes partially under the classification of a rural railway.

Live Stock Shipments on Interurbans

The Iowa interurban roads, as can be noted from the discussion at the Iowa convention, derive a great deal of freight traffic from live stock shipments. Iowa farmers have been abandoning grain farming and going into live stock so extensively during the past fifteen years that grain shipments at some of the most important trade centers now amount to but little. The farmers have found that live stock is the more profitable. Not only are the cattle shipped away from Iowa to the Chicago market, but there is considerable business done in buying stock from the Western stock ranches and fattening it for the Chicago market, as it is easier to fatten stock on an Iowa farm where grain is cheap than on open ranches in Nebraska and Colorado. The interurban railway is naturally preferred by farmers for the shipment of stock, because it usually has stock yards at more frequent intervals than the steam roads. A peculiar point regarding stock shipment in Iowa, which was brought out at the convention and which is of considerable engineering importance in connection with interurban railway undertakings in that State, is the custom of shipping a large amount of stock on certain days and none on other days. It has been the custom among Iowa stock shippers during years past to ship stock with the idea of having it reach the Chicago market on certain days of the week which were considered better than other days. This practice, of course, if adhered to, would make it difficult for an electric road to handle this kind of traffic because of the large amount of power house investment required to handle the heavy intermittent stock shipment. It appears like an absurd practice intentionally to cause congestion of stock trains on all railroad lines leading into Chicago, congestion at the stock yards and trouble all along the line from the farmer to the Chicago packing house. There may have been reasons for the Chicago market being better on certain days of the week in years past than on other days of the week, but judging from circulars recently sent out by Chicago commission houses, as well as from reports of some of the interurban railway men at the Iowa convention, efforts by the stock men themselves are being made to distribute stock shipments evenly over the entire week, which, of course, makes it much better from the interurban railway man's standpoint.

Traffic Agreements with Steam Roads

The present state of affairs as regards joint traffic agreements on freight and passenger business between steam and electric roads is both amusing and exasperating. It appears at the present time that the chances for an electric road securing a joint traffic arrangement with a steam is in direct proportion to the steam road's desire to get business away from some competitor by means of its electric feeder. We have known of numerous cases where a war between rival steam railroad companies has resulted in arrangements being made with electric roads where before it had been impossible to obtain them. At the recent Iowa convention, joint traffic arrangements were a fruitful source of discussion, both on the convention floor and off of it. Unquestionably, there are now enough entering wedges in the shape of joint traffic agreements between steam and electric roads so that before long the rock will be split wide open, and any electric road fulfilling certain requirements can obtain traffic agreements with steam roads. The present condition of affairs is an economic absurdity in many ways.

The Street Railway and the Laboratory

The relation existing between the modern street railway and the experimental laboratory does not at first sight appear to be particularly close. In the daily course of business the station instruments are generally adequate to meet the needs of the clerical department as far as keeping records of the power consumption, variations in voltage and current are concerned, and if wattmeters are placed upon the various cars at frequent intervals there would seem to be no special occasion for the making of very refined tests in daily service. On large systems it is important to make frequent tests, sometimes nightly, of the insulation of the feeders, but as this piece of work is a standard and routine operation, it can better be performed by the employees of each particular company than by an outside corps of specialists, both on the grounds of greater familiarity with the conditions and lower expense.

Every little while, however, the demand for some form of laboratory work makes itself felt on the most progressive systems. In many cases the engineering departments are amply qualified to handle the questions at issue, and on very large systems experimental laboratories are not uncommon for the sole purpose of investigating new problems which arise in connection with the physical plant of the roads. Smaller street railways are often without these facilities, however, and important questions are frequently left unanswered.

A few of the points which fall under the scope of laboratory work are: Calibration of power and sub-station instruments; calibration of testing galvanometers and portable voltmeters and ammeters; the analysis of materials; cement tests, tensile and compressive experiments upon miscellaneous materials; determination of the calorific power of coal and other fuels. Many of these tests and experiments require special apparatus which only the largest street railway companies can afford to own, so that the laboratory solves the problem with a minimum of trouble and, often, of expense.

Commercial testing laboratories are becoming more common, so that it is becoming more easy for those street railway companies which do not have their own laboratories to utilize their services. Where this is not practicable on account of distance, recourse may often be had to the nearest engineering school, and a variety of practical and interesting data secured through the co-operation of the college equipment and its instructing staff. The cost of having tests made at either the professional laboratory or the engineering school should be within the means of the great majority of roads, and the advantage of the practical character of the work to the school itself need not be enlarged upon. At all events, it is poor practice to put off the calibration of instruments and similar tests from year to year, unless after looking into the local conditions it is found out of the question to attempt such work. Where a road is advantageously located with respect to the manufacturers, the use of the laboratories of the latter is often the simplest solution of the problem. The question is worth thinking about in all its aspects.

Interurban Cars Within City Limits

Important as is the expeditious handling of traffic upon the cross-country portions of an interurban route, it is equally essential that operating conditions within city limits shall be favorable to the unrestricted movement of foreign cars if rapid transit is to be provided. In many cities this fact has long been appreciated, and interurban cars are pushed through to the terminals of the routes with every effort to avoid delays. There are still a good many cases, however, where the conditions are either unfavorable to the free movement of foreign cars or where the vital importance of giving preference to through over local service in point of stops and speed is not recognized. To operate a heavy car equipped with 200 hp in motors at speeds of 45 m.p.h. or over on a private right of way extending over perhaps 75 per cent of the distance between the urban centers, and then to be obliged to cut in a switch and hold the motors down to full four-in-series running as a maximum in covering the remaining 25 per cent of urban operation at a sacrifice of 20 per cent or 30 per cent in schedule time is an incongruous feature of electric railway practice, and one which is exasperating to passengers. It may be unavoidable in many cases, but is certainly preventable in others.

Without much question, the most valuable asset of steam roads doing a heavy suburban business is the extension of their private rights of way into the hearts of the cities served. It tends to offset the inconvenience caused by the concentration of passengers at a single terminal instead of distributing them throughout the business district by liberal transfers to intersecting trolley routes. Few interurban roads can afford to pay the enormous cost of even a single-track private right of way inside the business district of a modern urban community, but the advantages of such an entrance can sometimes be secured in other practicable ways. One of these, which is available completely or in part, is by running the interurban cars into the city down a thoroughfare of minor importance, near enough to be within easy walking distance of the busier streets and crowded lines of cars, and yet far enough away to avoid the traffic congestion of the main thoroughfares. It is a mistake to assume that an interurban car must enter a city by the front door, so to speak; the back way is often quicker, and hence more satisfactory all around. The admission of interurban cars by a side street or group of streets having but a moderate amount of travel upon their precincts not only brings the through passenger into the city with less delay—it leaves the other thoroughfares freer for the local traffic already existing. Another plan is not to attempt to bring all cars to a central distributing point, as in most cities, but to have several termini. This may arouse some popular opposition at first, as the patrons of each suburban line will naturally prefer their cars to pass through the main business street, but when the advantages which the new plan possesses in point of time are recognized, the objections should disappear.

The handling of foreign cars on an urban system introduces a number of complications which are not easy to avoid. Some system of express running with few stops seems to be the only solution of the problem on lines which already do an important local business, and even this is impossible if the city lines traversed carry a dense traffic. It was a wise move from the operating standpoint when one of the elevated roads in Chicago consented to the movement of Aurora, Elgin & Chicago trains express over its tracks instead of attempting to make local stops on the structure with these interurban cars.

The Sociology of Rapid Transit

An interesting and most important phase of rapid transit is its influence for the better upon the economic life of a great city, with particular reference to the slum population. It has long been recognized in many quarters that the trolley car has been and still is a tremendous factor in the betterment of housing conditions, but the direct influence of the subway and elevated line upon the welfare of the poorer classes has yet to be generally appreciated.

Social questions are largely conditioned by surroundings. Hence, if the rapid transit line alleviates the sufferings of slum life through the removal of thousands of poorly housed citizens to localities more abundantly supplied with fresh air and sunshine, and through the transfer of child life from the crowded streets to more wholesome playgrounds, great objects have been secured in the way of improved health, morality, education and even political honesty, quite apart from the fundamental supply of quick transportation. That the rapid transit line does this cannot be doubted. "Improved housing conditions in the tenement district," says the Boston "Transcript" in discussing this point recently, "can do something, but not a great deal. The area is limited, and, crowded as it is, the trade, industry and wealth of the city are forever pounding against it. * * * Unless there be a vent, the crowding becomes worse and worse, and the only satisfactory vent is that furnished by cheap rapid transit."

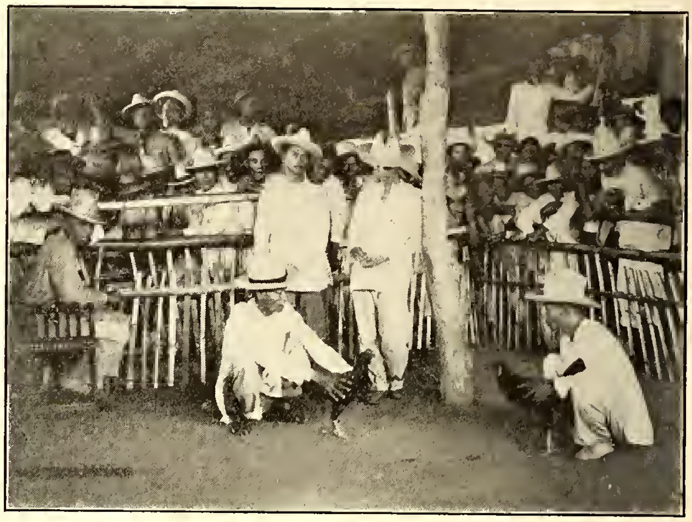
It may be urged by some opponents of rapid transit extensions that the poorest class of society is unreached by even 5-cent rapid transit. Since competition is keener as the scale of labor descends, on account of the lower average of ability required, hours of work are longer, and it becomes more and more necessary for the laborer to live near his place of employment. Among the poorest class this requirement becomes so insistent that in many cases no rapid transit system can compete successfully with the cheapness and facility of a short walk. Nevertheless, there are many different degrees of existence even in the tenement house district, and the sociological value of rapid transit therefore "lies in the constant drawing away of the upper strata which makes possible without increased discomfort the admission of the steady influx at the bottom. Even though the rapid transit line may not secure the daily patronage of the upper stratum of slum population, it does affect the stratum just above, leading it away from its former cramped and unattractive habitations and making room for the occupancy of the upper stratum of slum population." A sort of moving up takes place all along the line.

Far-reaching also are the effects of a new rapid transit service upon the conditions of life in less densely populated sections of a city, extending into even the outlying suburbs. The saving of ten or fifteen minutes in transit at morning and night means a total saving in a year made up of 300 working days of from 12½ to 18¾ days at 8 hours each. When such a saving as this, representing the case of but a single individual, is multiplied into the lives of thousands, it requires little imagination to see why the rapid transit line is the very backbone of suburban life in its highest types. There is every reason to believe that in the writings of future sociologists the beneficent aspects of rapid transit will be appreciated as never before, and that the effect on the average individual of pure air, healthy surroundings and a broader environment will be a higher standard of living, both morally and physically. The proper presentation of those aspects before municipal authorities will do much toward disarming opposition to the legitimate extension of high-speed facilities.

OPENING OF THE ELECTRIC RAILWAY SYSTEM IN MANILA, P. I.

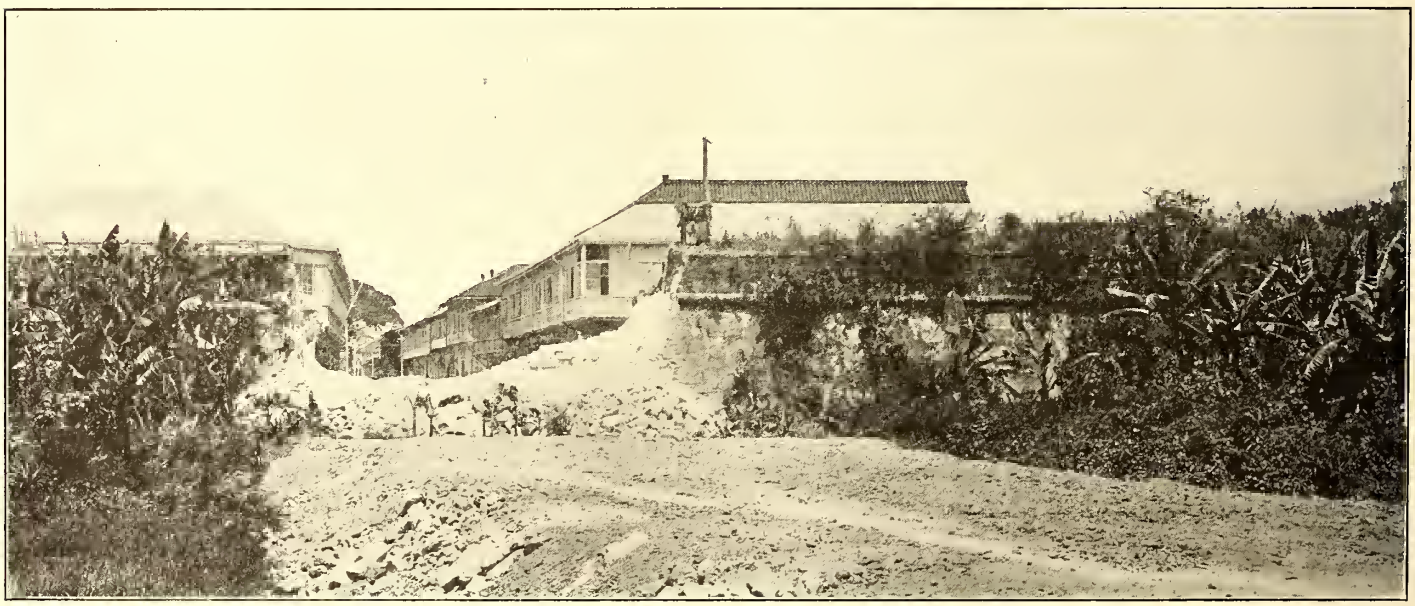
Almost immediately upon the accession of the Philippines, and simultaneously with the process of pacification by the United States, forces, both civil and private, entered into the work of reorganizing the public institutions and utilities in the islands. Announcement of the opening of the Manila Electric Railway system brings to a close a particularly interesting piece of reconstruction, and to-day the chief city of the island boasts of an electric railway as thoroughly up-to-date as anything of its size that can be found in the United States.

A TYPICAL SCENE ALONG THE MANILA WHARVES



THE NATIONAL PASTIME

Three years ago the tramway facilities of Manila were limited to 13 miles of light track, upon which were operated half a dozen diminutive horse cars, seating from eight to twelve persons each. That this system was entirely inadequate is shown by the fact that at that time nearly 10,000 vehicles (two-wheeled "carromatas," "quilez" and "calesas") were licensed; about half of these were used for public service, the others being private. The fares charged were high, and it was almost impossible to secure vehicles except by previously engaging them. It was estimated that over $4,000,000, Mexican, were collected per annum by the public passenger vehicles. Again, the incapacity of the local utilities made it necessary for the government to maintain a large number of government cabs for the use of public officials during business hours.



A BREAK IN THE OLD CITY WALL TO PERMIT THE PASSAGE OF THE TRAMWAY CARS

Conditions are such that nearly all business men and clerks in Manila return to their homes for "tiffin" at noontime, and this is largely responsible for the enormous midday traffic. It is not unusual for passenger vehicles, carrying from one to four persons each, to cross the bridge of Spain at the rate of 800 an hour. The curve on page 775 is plotted from notes made at the bridge of Spain, and may be considered fairly typical of the distribution of traffic.

Before the American occupation, the tramways were owned by "La Compania de las Tranvias de Filipinas," which also owned and operated a steam line 4½ miles long, running from the city limits to Malabon, a town of 12,000 population, located north of Manila on the bay, and passing through the intervening towns of Caloocan and Tondo. Ordinarily, on this steam line, a single train of two cars sufficed, but on holidays and fiestas four cars were required. The horse car line was divided into seven different sections, over each of which a 2-cent fare was charged. No attention was paid in the operation of cars to requirements of traffic, and the operation was so irregular that no dependence could be placed upon the service.

The tracks existing were of extremely light construction and narrow gage. On the steam line to Malabon, T-rail weighing


MAP SHOWING LINES
OF THE
MANILA ELEC. R.R. & LIGHT CO.
J. G. WHITE & COMPANY
ENGINEERS CONTRACTORS
MANILA BAY
PASIG RIVER
ESTERO

35 lbs. was laid on molave ties 4 ft. 7 ins. long, 7 ins. wide and 4 ins. thick. The track was located along the side of the highway and ballasted with earth, sand and gravel. The rails on the horse car lines weighed 56 lbs., and were ordinarily laid directly on the earth and macadam, without sleepers, but with tie rods every 6 ft.

Early in 1902 an investigation into the possibilities of combining the electric lighting and power interests and the tramway system of Manila, and electrifying the latter, was made by C. G. Young, general superintendent of construction for J. G. White & Company. Mr. Young went to Manila and prepared the details of and made application for a franchise covering an electric railway and electric lighting system, which later was awarded after public bidding, and soon thereafter a syndicate composed of this company and others purchased the existing horse car system and the steam line running to Malabon. The transformation of the horse car line into an electric system very closely followed the recommendations made in the preliminary report, and at the present time the Manila Railway & Lighting Corporation is beginning the operation of 30 miles of street railway and 10 miles of what might be called suburban lines, and is supplying, from the same power house, light and power for both municipal and private use. The syndicate also purchased the existing lighting plant from "La Electricista" of 1200 kw capacity. This plant is now of such antiquated type that the load will be gradually changed from it to the new plant, and dismantlement will follow.

THE BRIDGE OF SPAIN

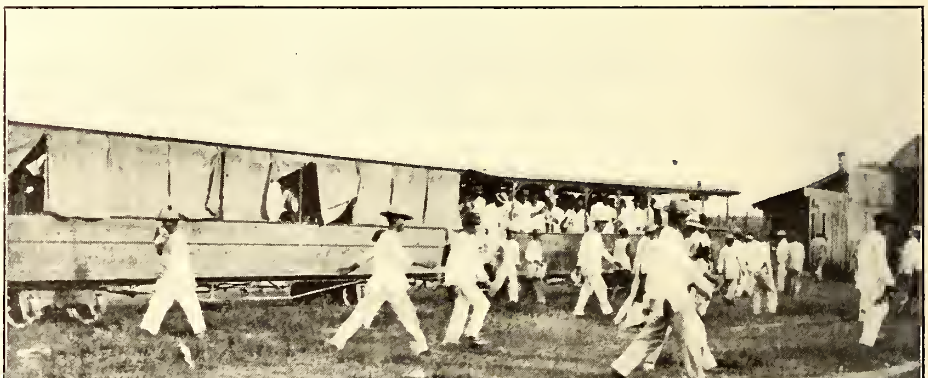
The map of the city of Manila and vicinity on page 767 indicates the location of the tracks, while that on page 774 shows the feeder and trolley system. Lines radiate from "La Escolta" (the shopping district) to the various suburbs, race tracks, cock pits, etc., the longest line extending to Malabon, approximately 6 miles out along the bay.

TRACK CONSTRUCTION

A large portion of the streets of Manila are paved with macadam, a few of the principal business streets being laid with block granite; a considerable amount of hardwood block pavement has also been used. In the macadam 70-lb. A. S. C. E. section T-rail has been laid, while in the paved streets 94-lb. girder rail is employed. Nearly all of the steel was purchased in Belgium, owing to lower prices at the time of purchase, although later some was bought in the United States on a reduction of price. The T-rail is laid on ties 24-in. centers, with special angle-bar joints, Harvey grip track bolts and the lag screw spike, instead of the standard railroad spike. This spike is employed extensively in Europe, and necessitates boring the tie before the spike can be screwed in by means of a socket wrench. It has proved a great success.

The peculiar climatic conditions and the presence of the "white ant" rendered the selection of structural material extremely difficult, and a great deal of experimenting has been done during the past two years, and will be conducted in the future, with a view to obtaining more definite and complete information on this subject than is now available.

The investigations made by the United States Bureau of Forestry were carefully studied and proved of great service. However, woods which were reported by the bureau to be immune from the attacks of the "white ant" were found to be destroyed in certain localities, where other wood, presumably more to their liking, was scarce. An excellent tie was found in jarrah, a hard wood from Australia, resembling, in its structure and color, teak. Molave, a native wood, was also extensively used, but the inability of the native market to supply it in the quantities desired made it necessary to look elsewhere. California redwood was also tried in various ways, natural, treated with carbolineum, treated with jodelite and soligumn, and again when treated with creosote oil. It was found that the ants did not attack it except in certain localities where more desirable food seemed scarce. Disintegration of the steel rails is another peculiarity of this climate, and it may be said that their life, when unprotected, is only about one-half that of rails in the United States, under similar conditions of service. This made it necessary to paint the rails and joints thoroughly with asphaltum, and all structural steel in the power plant construction was treated with a special carbon paint, with the same end in view.



CROWD LEAVING OLD SUBURBAN CARS FOR COCK PITS

OVERHEAD CONSTRUCTION

Trolley and feed wires are supported on cross-arms treated by carbolineum. Both wood and tubular steel poles are used; for the former, ipil, a native hard wood, dark and of dense structure, was found the most serviceable. Both iron and wood poles are set in concrete, and the former is reinforced by a 4-ft. section, shrunk on, and extending 2 ft. below the ground. This reinforcement has been found exceedingly valuable and practically doubles the life of the pole. On iron poles an ornamental bracket is used. In the narrow streets all wires are carried immediately over the streets on wood brackets attached to iron tubing, this being supported at either end by 4-in. pipe vertically erected at the house line with cross struts, raising them well above the balconies of the houses, the whole being substantially braced. This construction is shown on this page, and is used only within the Walled City, where the streets are extremely narrow, from 20 ft. to 30 ft. wide. The average streets of Manila are comparatively wide, from 30 ft in some sections to 100 ft. in some of the principal streets.

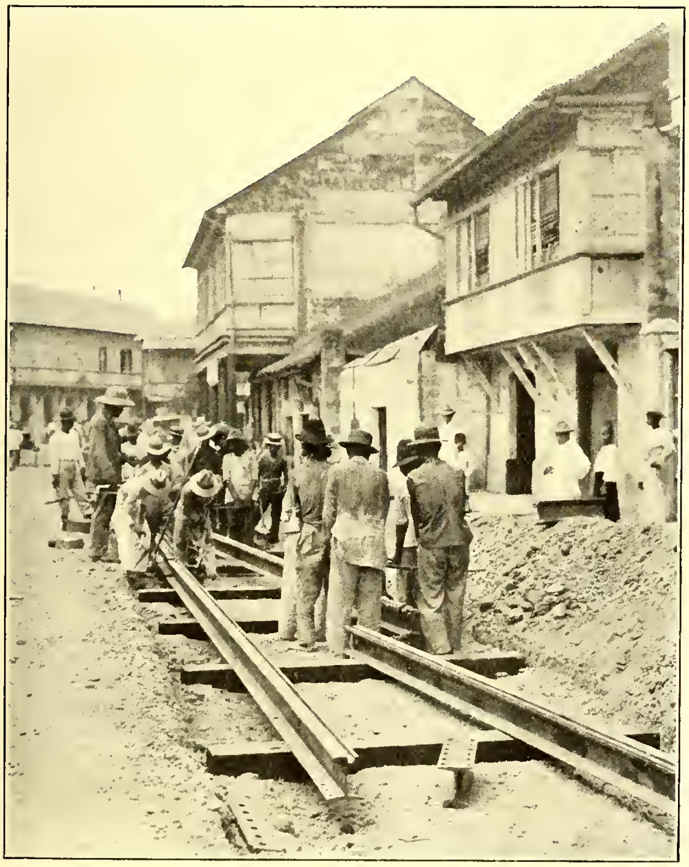
Three hundred steel tubular poles were shipped from the United States for use in bracket construction on the principal thoroughfares. The cost of a wood pole is approximately three times that of a similar pole in this country.

Two trolley wires are used over all single track, these being placed about 6 ins. apart, separating at turn-outs and switches. Where double track is used, or on adjacent parallel streets, one of the trolley wires is carried over each track. No. 000 B. & S. wire is used.

The lines have been sectioned by means of trolley insulators introduced at suitable points in such a manner as to reduce to a minimum possible interruption to traffic occasioned by trouble on any one section. Switches are arranged to bridge these insulators, if desired, thus making it possible to utilize the overhead copper to the greatest advantage.

In like manner the eight independent feeders supplying the various districts are so designed as to reduce supply troubles to a minimum, the peculiar indirect routing of the cars being also a factor in this problem. The feeder system contains the equivalent of 25 miles of No. 0000 cable. The rails taken from the old horse car line have been utilized as return circuits by bonding together and connecting the power house ground with load centers.

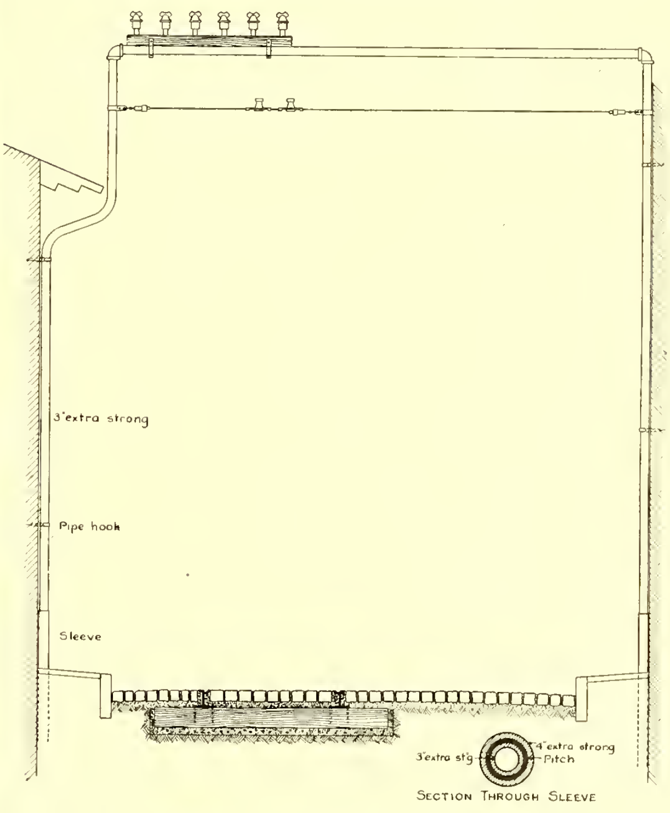
TEARING UP OLD T-RAIL



TRACK-LAYING GANG AT WORK

NATIVE LABOR

At the beginning of construction work considerable trouble was experienced in dealing with the native workman. The demoralized state of labor made it impossible to secure reasonable results, and in order to bring about the best results, Mr. Belden, the engineer in charge, made a careful study of the labor question. His success in dealing with the natives was evidenced by the fact that the leading Manila paper commented editorially on the high efficiency of his working forces, giving his organization the credit for being the first to operate successfully with native laborers. Mr. Belden found that the

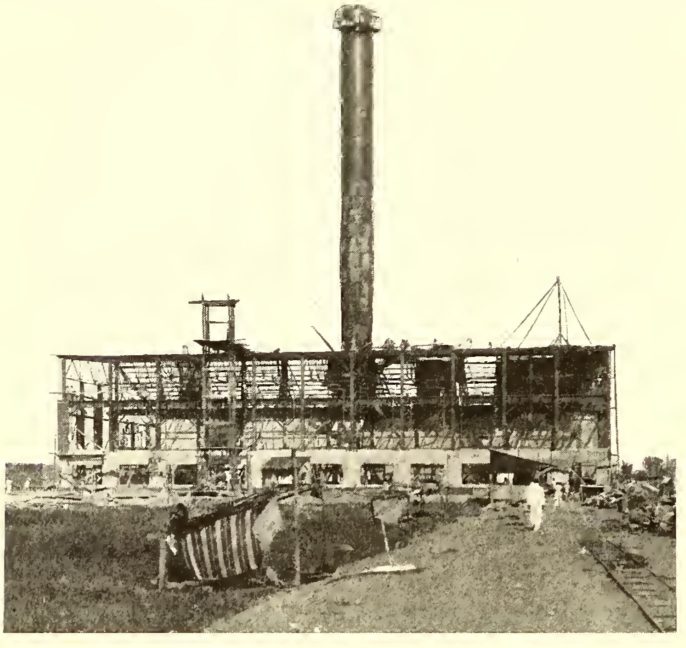


WOOD BRACKET AND TUBING CONSTRUCTION EMPLOYED IN NARROW STREETS

Filipinos are very adaptable and quickly acquire any of the more common trades. They make excellent carpenters and can be used to advantage as riveters and machinists on structural iron work. While small of stature and unable and unwilling to attempt heavy work, they make up for this in their mobility and cleverness. In this connection it is an interesting fact that the entire crews, from captain down, employed on the tugs used by J. G. White & Company in connection with their harbor improvement work at Iloilo and Cebu, are natives, as are also all of the machinists and repair men in the car shops.

POWER STATION

Power is generated in a steel and concrete structure, located on a large island in the Pasig River, practically central in regard to the territory which it will serve. The Pasig River furnishes a waterway to the ocean, making it possible to deliver



A VIEW OF THE POWER STATION DURING CONSTRUCTION

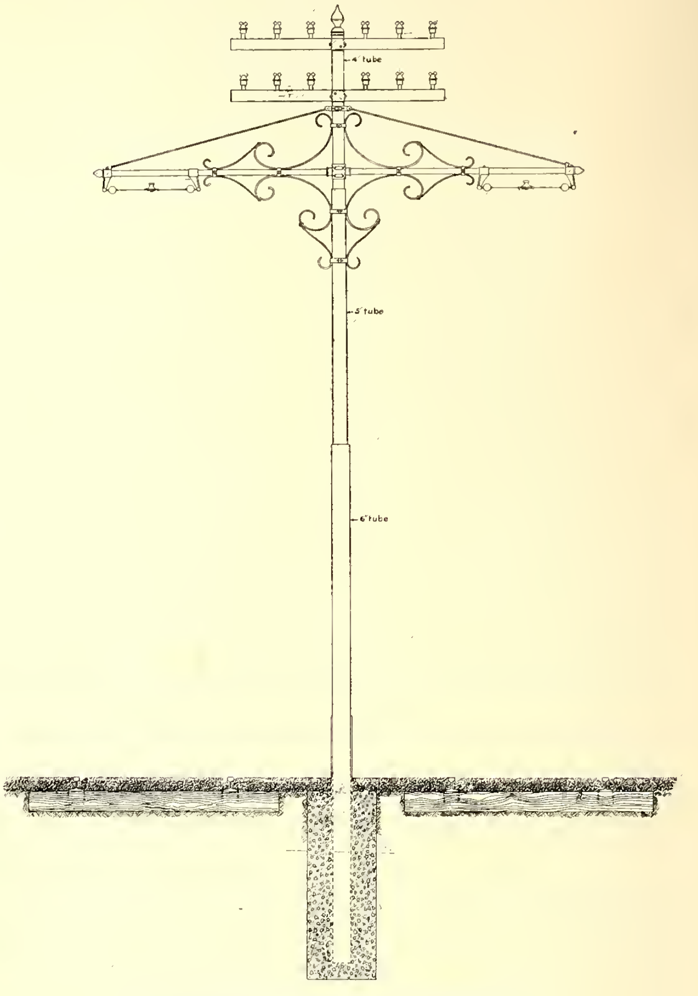
the coal, which is brought from Japan and Australia, directly to the power house by lighters.

The main building consists of an engine room and a boiler room. The former is 47 ft. x 170 ft. and 25 ft. high, with a basement 12 ft. in height. The boiler room is the same length and 54 ft. wide, its floor being on the same level as the basement floor of the engine room. The frame of the power house is of structural steel, consisting of columns, roof trusses and purline. The walls of the engine room are of poured concrete, while the roof and floor are concrete slabs. The boiler room has corrugated iron side and roofing. The siding, however, extends only to within 12 ft. of the ground, the open construction being necessary in order to gain ventilation in this climate. The windows are set in steel frames, the sashes being made of native hardwood.

Owing to the low bearing value of the soil, the foundations are laid on piles driven to an average depth of 20 ft. to a hard sand stratum. The tops of the piles are covered with a 2½-ft. concrete mattress. The foundations for engines and all heavy machinery are also set on piles.

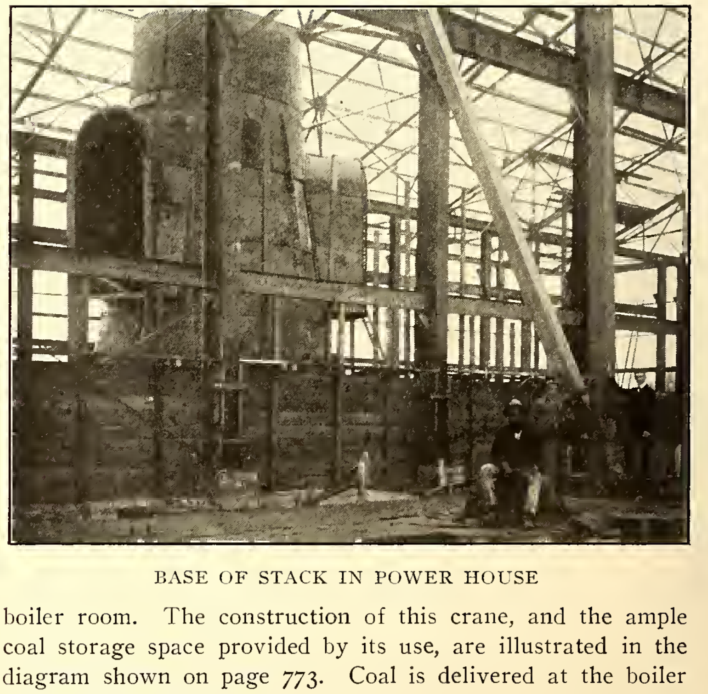
The boiler equipment consists of eight Babcock & Wilcox boilers, rated at 400-hp each. The boilers are arranged in two batteries, of four each, on either side of a self-supporting steel stack 175 ft. high. The stack is lined its entire length with fire-brick, and has two nozzles, to which the smoke flues are connected. These latter are of steel and of the buggy-top type. Steam is generated at 200 lbs. pressure, and is superheated to 600 degs. The arrangement of the boiler room, as well as of the engine room, is such that future expansion can take place symmetrically on either end. The boilers at present are provided with flat grates, although provision has also been made for a possible future installation of stokers.

The coal is brought from Australia and transferred, in the harbor of Manila, to barges having a capacity of from 200 tons



TYPICAL CENTER-POLE CONSTRUCTION

to 300 tons. These barges being brought alongside of the power house, the coal is unloaded by means of a radial gantry crane, which has a capacity of 50 tons per hour. It is either deposited in open air storage or delivered by the crane directly to the



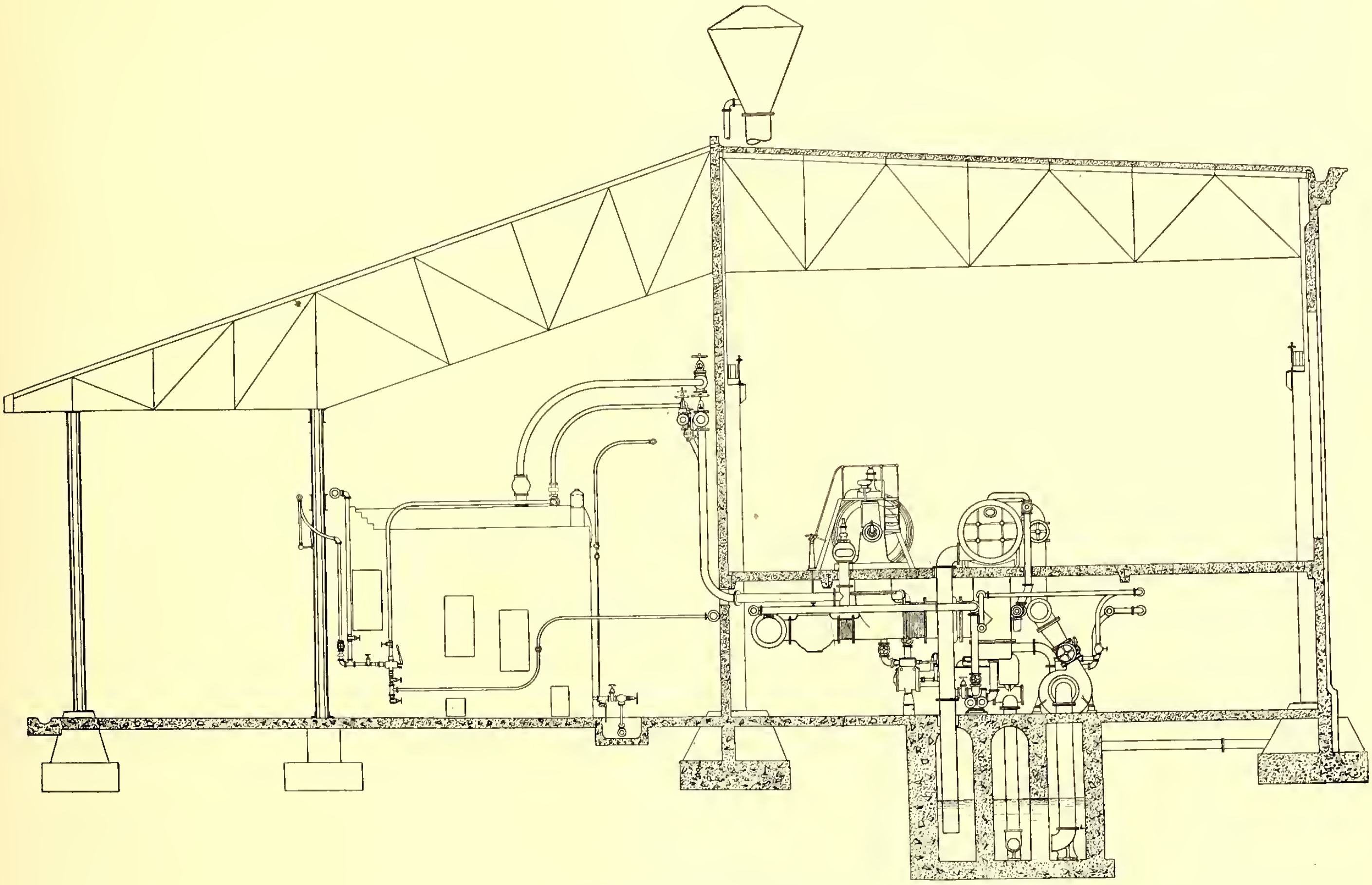
BASE OF STACK IN POWER HOUSE

boiler room. The construction of this crane, and the ample coal storage space provided by its use, are illustrated in the diagram shown on page 773. Coal is delivered at the boiler for approximately $5.75 per long ton, and is guaranteed to contain 13,000 B. T. U.

Water for the condensing plant is taken through a concrete intake 3 ft. x 11 ft., extending to the Pasig River on one side of the island, and is discharged through a tunnel built from the power house to the opposite side of the island. Air blast ducts have been provided for the boilers, as at some future time it may become necessary or advisable to install a forced draft system.

Three 15-in. double-suction centrifugal pumps, each connected to an 8½-in. x 8-in. Westinghouse engine, and having a capacity of 7000 gals. per minute, discharge the condensing water into a main header, which distributes it to the condensers. Each condenser has a hot-well pump automatically operated by a float, the hot wells being located under the condensers.

Feed-water is obtained from driven wells and is raised by means of compressed air into a standpipe 14 ft. in diameter x 60 ft. high, which is located at one end of the boiler house. Condensed steam is delivered by the hot-well pumps to a steel hot well located in the boiler room immediately in front of the stack; here it joins with the make-up water taken from the standpipe, and is fed by gravity through feed-water heaters, which are of the closed type, to the feed-pump suction. Each boiler is also provided with a Metropolitan double-tube injection. The feed-water heaters have a total capacity of 1500 hp. From the boilers superheated steam is distributed through an 8-in. main header, mounted on substantial structural brackets on the boiler room wall. From the header, connection is made to the turbines through a steam line passing under the engine room floor. All fittings on the high-pressure lines are of cast steel, and the valves are provided with nickel bronze seats and discs. All drains from the steam lines are returned to the boiler by means of a Holly gravity system. The steam from the 750-kw turbines is condensed in a 3000-sq. ft. Alberger surface condenser, located on the engine room floor. The 1500-kw turbine is connected to a 6000-sq. ft. condenser of the same type.



CROSS-SECTION OF STATION

CONSTRUCTING CONDENSER INTAKE AND DISCHARGE

TURBINES, GENERATORS AND AUXILIARIES

In the engine room are located the following:

Three Westinghouse-Parsons 1000-hp turbines, direct connected to three 750-kw turbo-generators. The turbines will be operated at 200 lbs. pressure with a vacuum of 27 ins., at a speed of 1800 r. p. m. The generators will be three-phase, 370 volts, 60 cycles.

One 2000-hp turbine, connected to one 1500-kw generator, as above. This machine is now being installed.

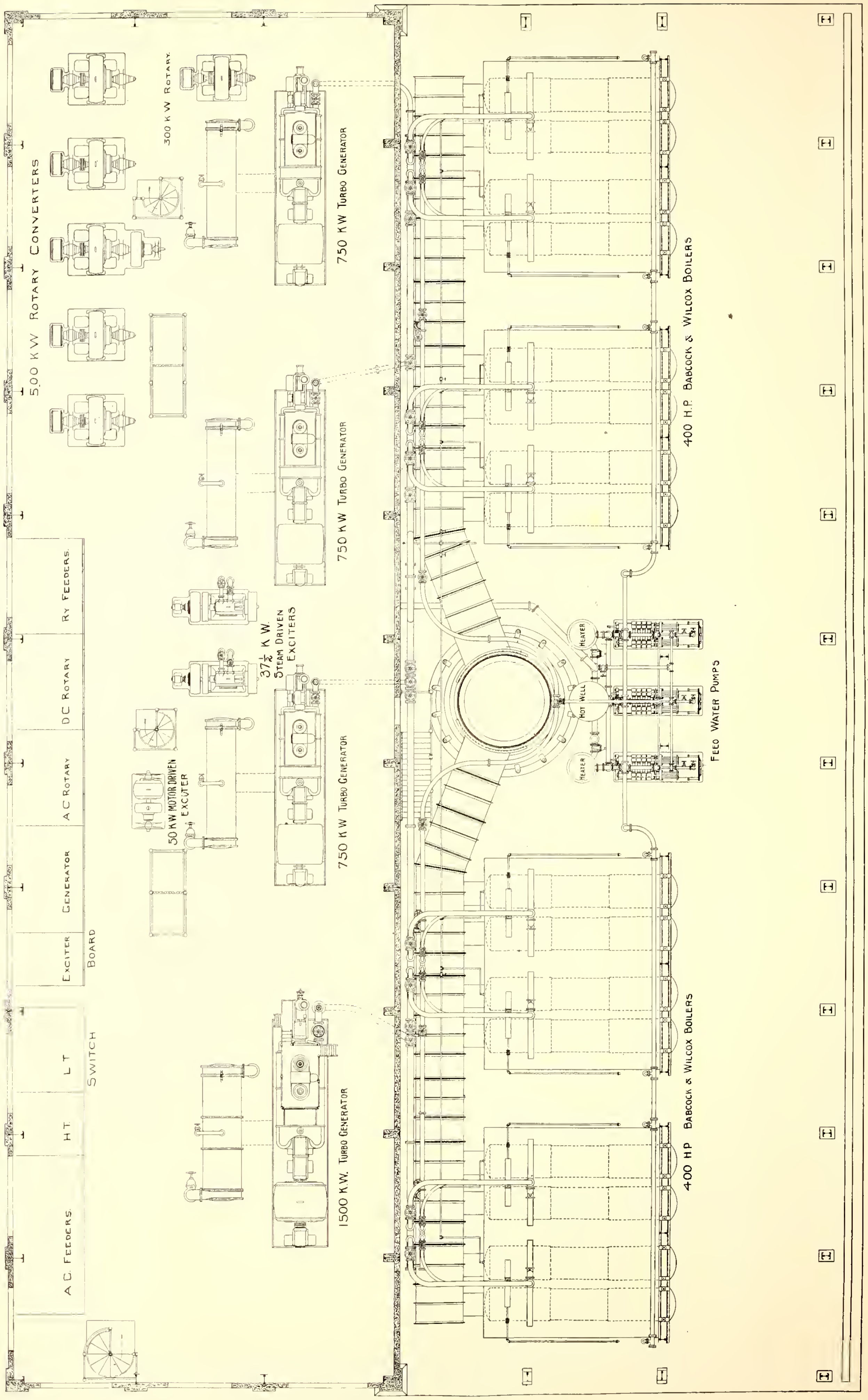
Three 500-kw rotaries, 370-600 volts.

One 300-kw rotary, 370-600 volts.

One 125-kw booster, direct connected to one of the above rotaries.

Four 250-kw oil-cooled transformers, 360-3400 volts, 60 cycles.

Two 500-kw transformers, 360-3400 volts, 60 cycles.



PLAN OF POWER STATION OF THE MANILA ELECTRIC RAILROAD & LIGHT COMPANY

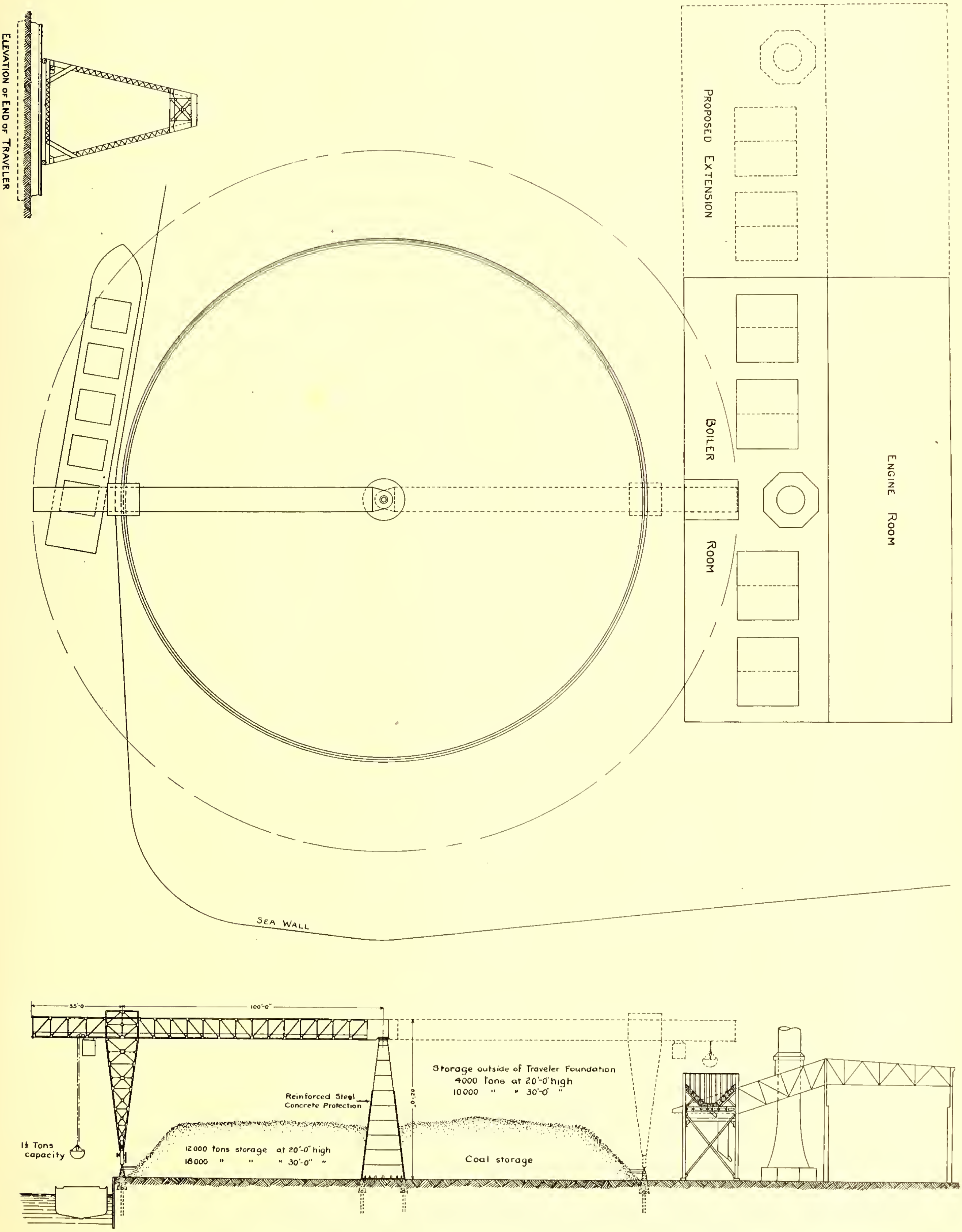
One 50-kw motor-driven exciter.

Two 37½-kw steam-driven exciters.

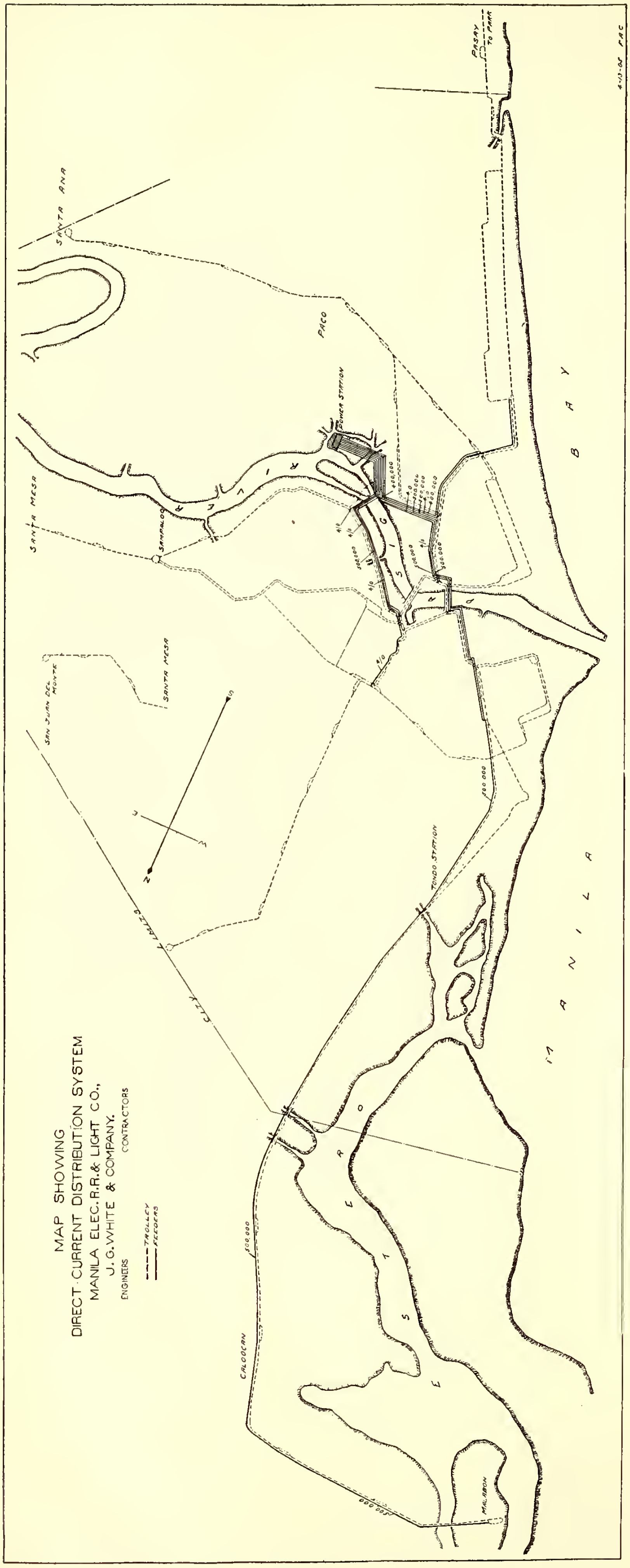
It will be remembered that this company also supplies current for lighting and general power purposes throughout the city, and the transformers and auxiliary apparatus enumerated above are used in connection with the high-tension distribution system. The switchboard contains forty-four panels and extends along one side of the engine room. It is 105 ft. in length.

ROLLING STOCK

The rolling stock at present provided consists of 100 cars.



PLAN AND SIDE ELEVATIONS OF GANTRY CRANE AND STORAGE POCKET



LAY-OUT AND SIZES OF DIRECT-CURRENT FEEDERS FOR THE MANILA RAILWAY AND LIGHTING SYSTEM

As in the case of track construction, the question of materials became an important factor, especially as regards the ravages of the "white ant." On this account the cars are of steel and teak wood construction. The majority are of the standard cross bench, open type, largely used in the United States during the summer months, while to provide for the rainy season, when, though not excessively cold, the weather is somewhat uncertain and severe drenching rains are of frequent occurrence, a number of convertible and semi-convertible cars will be used. One modification consists of reducing the width of the cars to 7 ft., on account of the narrowness of many of the streets, and five Filipinos find ample space on one seat. For this same reason single-truck cars must be used on many of the lines. The first order for cars was placed with the Belgian firm, "La Metallurgique," as follows:

Fifty-five single-truck, ten-bench, open.
Six double-truck, twelve-bench, open.
Four double-truck and combination.

The Electric Railway & Tramway Carriage Works, of Preston, England, are building fifteen semi-convertible double-truck cars, and an order for fifteen full convertible cars has been placed with the J. G. Brill Company, of this country. The single-truck cars are equipped with two 40-hp Westinghouse motors, the double-truck with two 50-hp motors. Large capacity motors were selected, not on account of the grades, but because of the high temperature in which they are required to operate.

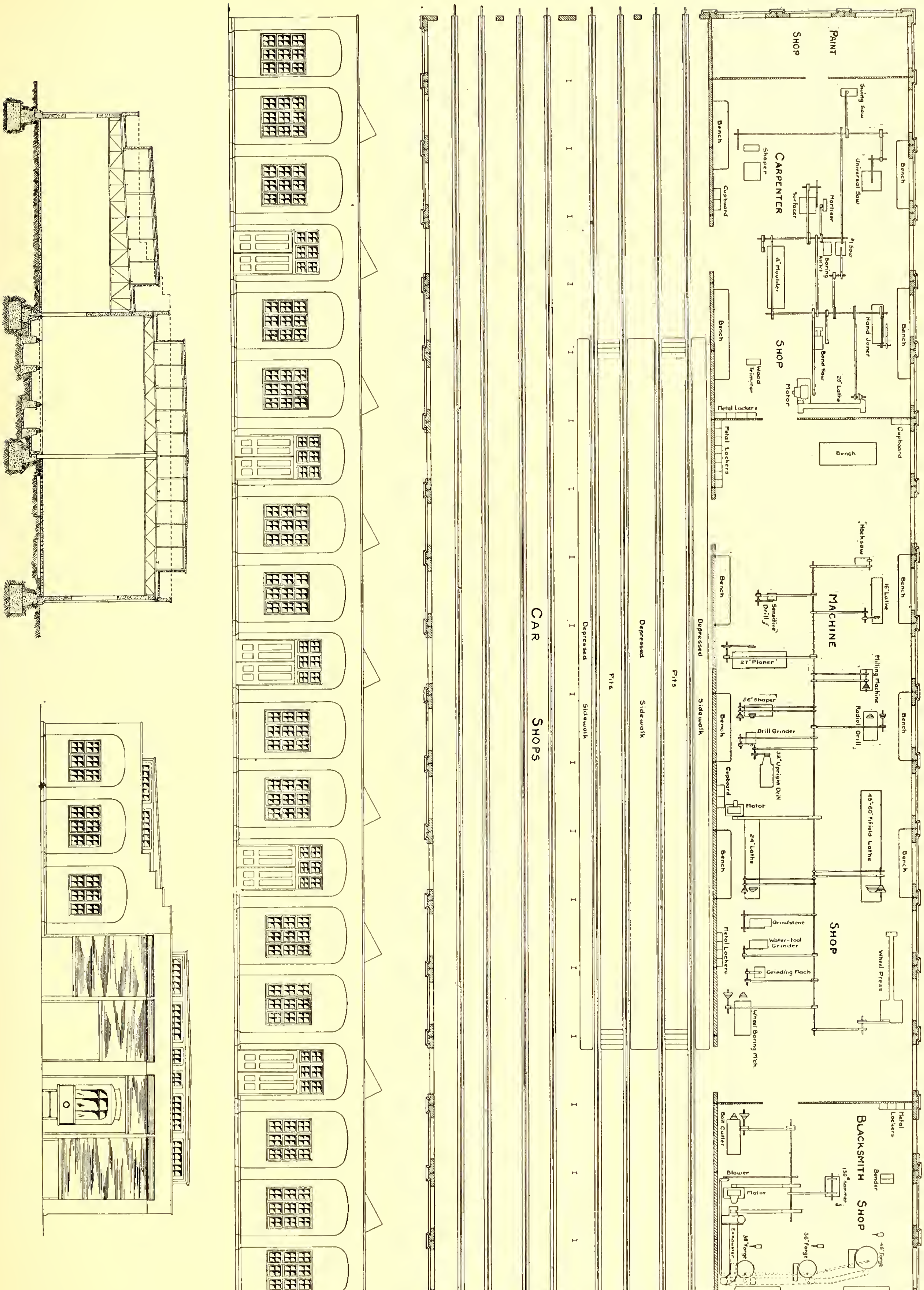
Peckham single trucks and Brill maximum traction trucks are used. The steel-tired wheels are supplied by the Hadfield Steel Foundry Company, Sheffield, England, and have detachable steel tires. Portable screen partitions are used for separating first and second-class passengers.

FARES

The Canadian system of fare collection by means of fare boxes has been adopted. The present fare will be 12 centavos, or 6 cents, for a first-class ride within the city limits, extra fare of 3 cents and 5 cents per every 2 miles being charged on the interurban sections of the line. A second-class fare is 10 centavos, and will probably be the more popular. The adoption of a gold basis, with the ratio of 2 to 1, has resulted in unquestionable stability in the monetary system. The new system of coins includes 1-centavo, 2-centavo and 5-centavo pieces in copper, worth, respectively, ½, 1 and 2½ cents; 10, 20 and 50 centavos and 1 peso, in silver, corresponding to 5, 10, 25 and 50 cents. The 10-centavo piece (value, 5 cents) is the same as the United States dime. The 50-centavo corresponds in size to our 50-cent piece, with a 20-centavo intermediate, while the 1-peso contains approximately the same amount of silver as the American dollar. This currency will obviously necessitate the payment of two coins for a first-class fare, a 10-centavo and a 2-centavo piece. Tickets are also issued at reduced rates.

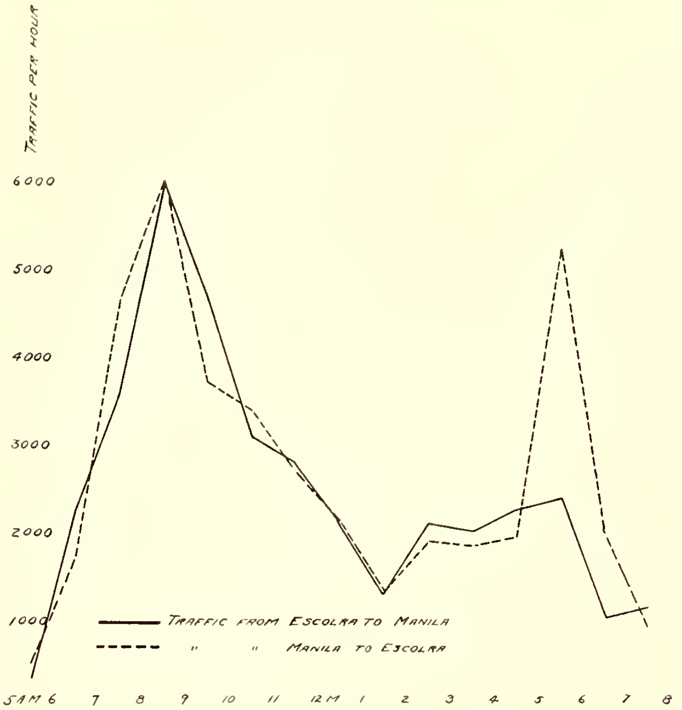
CAR HOUSES AND REPAIR SHOPS

On the main line near to the power house are located the offices, car houses and car shops. The former are of steel construction,



PLAN, ELEVATIONS AND SECTION OF CAR SHOPS built in the form of a hollow square, corresponding in this particular to the typical Philippine buildings. The first floor is devoted to storage tracks and locker rooms; the second contains offices and quarters of various kinds. The repair shops are unusually well equipped, as the distance from the base of supplies rendered necessary the repair of all cars and equipment on the grounds, and eventually it is proposed that the additional cars will be entirely built in these shops by native workmen and from native woods. Reference to the plan and cross section of these shops, as published on page 775, will indicate the very complete equipment.

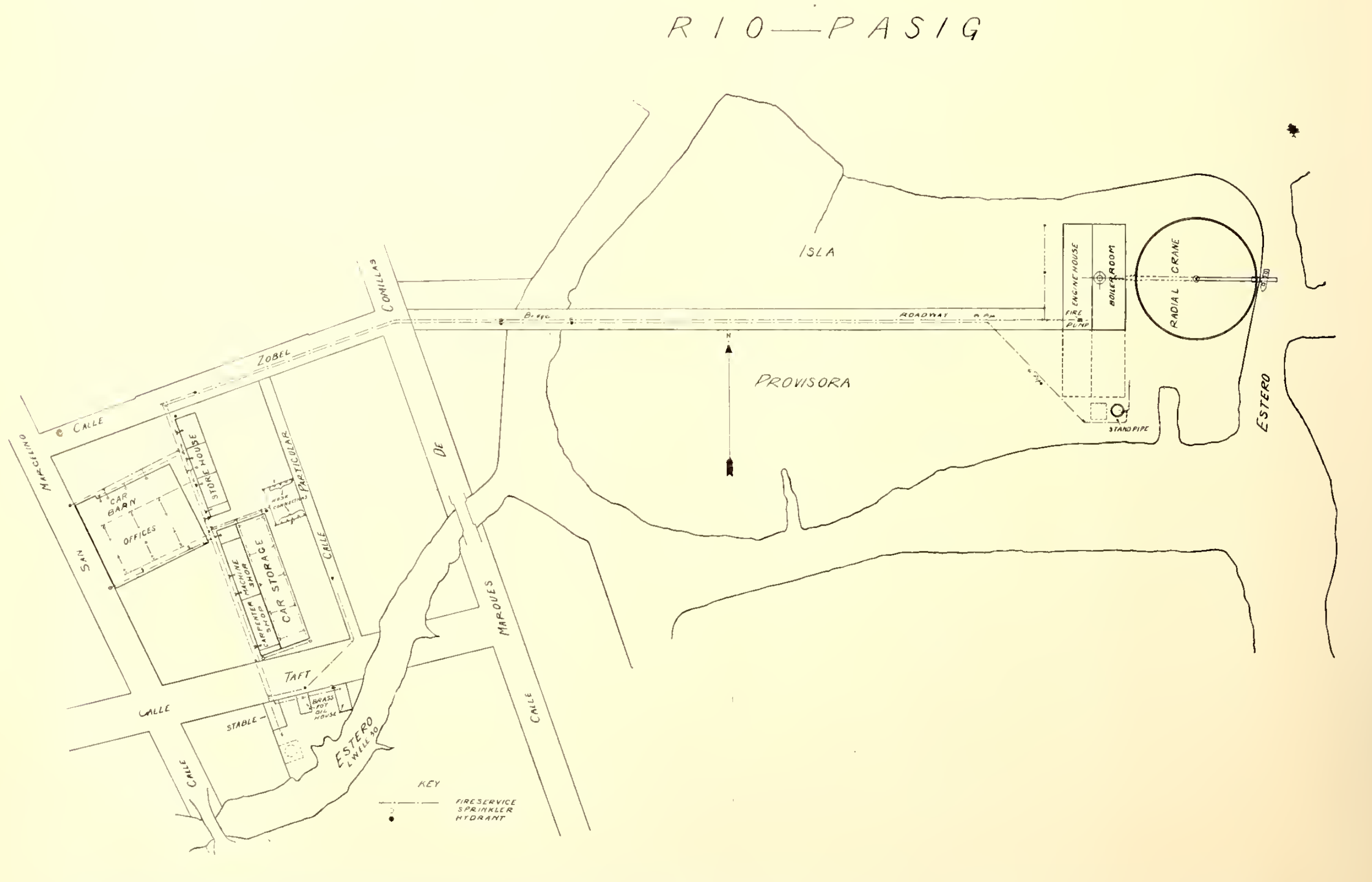
Another department necessitated by its isolated location is the printing office, in which all necessary tickets, forms, timetables, advertising posters, etc., will be printed. This latter is probably an innovation for electric lines of this size, although some of the largest systems in the United States have their own printing offices.



CURVES SHOWING HOURLY TRAFFIC OVER THE BRIDGE OF SPAIN FROM 5 A. M. TO 8 P. M. FOR AVERAGE DAY

IMPROVEMENTS ON THE BROOKLYN RAPID TRANSIT

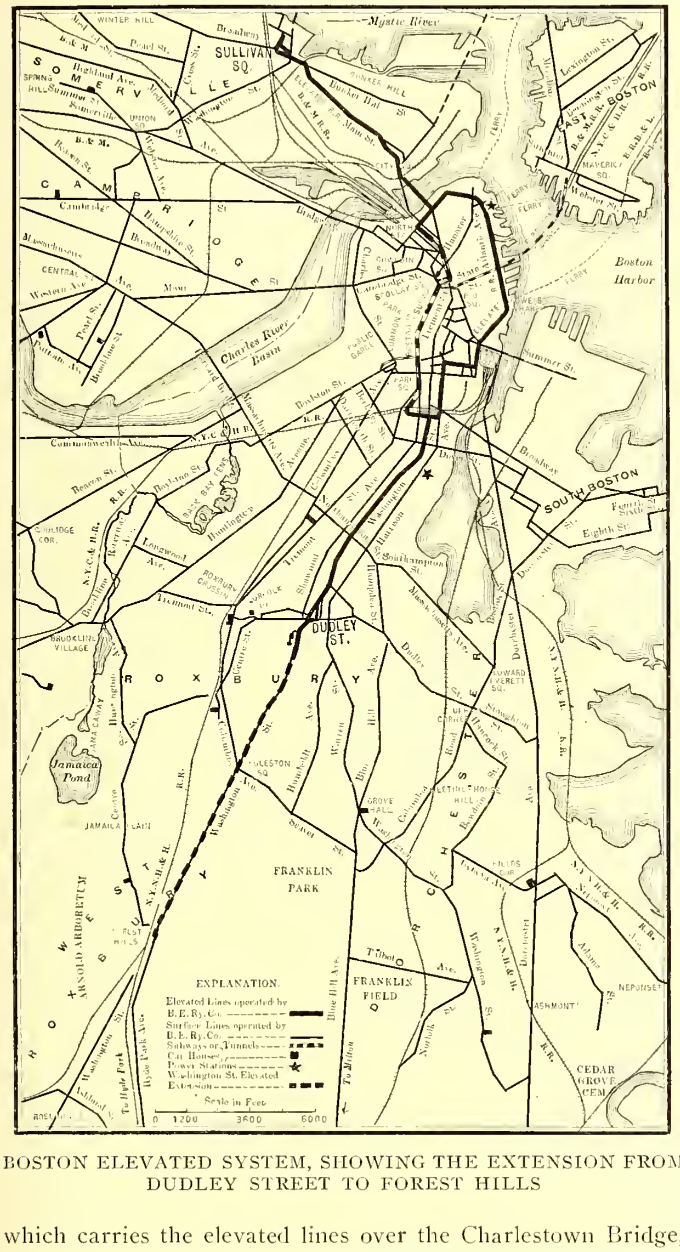
The engineers of the Brooklyn Rapid Transit Company are engaged on a number of plans for the development of its system in the suburban sections. The company owns a number of franchises in Flatbush, Flatlands and Gravesend. A good part of the work of construction in these neighborhoods has been held back because of the city's failure to open streets. The extension of the railway company's line through Nostrand Avenue to Avenue U is one of the developments which is shortly to be undertaken. Another will be the building of the railway through Utica Avenue, from its present terminal at Church Avenue, so that it will connect with the Flatbush Avenue, Bergen Beach extension. This will open up an entirely new territory. At the present time it is chiefly farm land beyond Church Avenue, but it is property readily susceptible of development into an attractive suburb. The work on the extension of this line of railway will be begun this summer, and will probably be finished soon, as there is only a little more than a mile and a half of track to be laid in order to make this connection with the Bergen Beach line, and to provide the upper Fulton Street section of Brooklyn with direct transit to this pleasant seaside resort. The cost of the work will be about $55,000.



PLAN OF PROPERTY, SHOWING FIRE AND SERVICE WATER SYSTEM, FOR SHOPS, STOREHOUSE AND CAR HOUSE

EXTENSION TO THE BOSTON ELEVATED

Work on the Washington Street extension to the Boston Elevated Railway is well under way. As may be remembered, this new line is an extension of the elevated structure from Dudley Street, the present southerly terminal, south over Washington Street to Forest Hills, a distance of 2½ miles. On this new work the plans provide for a plate-girder structure instead of the lattice-girder construction which was followed when the Boston Elevated Railway built its first overhead lines. It is believed the plate girder will make a more rigid and a less noisy structure than the lattice-girder design. The new construction will be very similar to the plate-girder structure which carries the elevated lines over the Charlestown Bridge, and which has been described and illustrated in these columns.



BOSTON ELEVATED SYSTEM, SHOWING THE EXTENSION FROM DUDLEY STREET TO FOREST HILLS

The elevated line to Forest Hills provides for two tracks, and the extension will be operated as a fast express service, the idea being to cut down materially the time now consumed in getting into Boston by surface car from some of the southern suburbs. Forest Hills is a common center for a number of surface lines serving West Roxbury, Hyde Park, Milton and other adjacent suburbs, and when the elevated extension is finished it will be possible for passengers to change at Forest Hills from the surface cars and continue the trip into Boston on the elevated, thereby saving from twenty minutes to half an hour on the journey.

Although the plans are not as yet fully determined, the present idea is to have but one station between Dudley Street and Forest Hills. This will probably be located about midway between the two terminals, somewhere in the vicinity of Columbus Avenue and Egleston Square. A number of suburban surface lines also center at this point and, as in the situation at Forest Hills, the surface car traffic will here be diverted to the elevated, saving considerable time for the through passengers and leaving the surface cars comparatively empty to pick up the short-haul travel into Boston. At both points free transfer will be given between the surface and elevated.

As there will be but one stop in the 2½ miles between Dudley Street and Forest Hills, it is believed the whole distance can be covered in about nine minutes by the regular trains. The extension is in line with the avowed policy of the Boston Elevated management to give the best possible service over all the territory served by its lines, and thereby bring Metropolitan Boston into closer touch with the heart of the city proper.

As can be imagined, the extension will involve material changes at Dudley Street station, in order to convert it from a terminal, as at present, into a combined terminal and through station. Various studies for the new layout at this point, and also for the mid-station and the Forest Hills terminal, have been made, but these have not as yet been fully perfected as to details.

On the new line the same standards as to track and location of third rail will be carried out as on the present elevated lines so that for purposes of operation the extension will become an integral part of the present Boston Elevated system. It is believed this extension will be ready for use by July 1, 1906.

PAPER ON ELECTRIC TRACTION

In a paper discussing the relative advantages of steam and electric traction, to be presented at the International Railway Congress by Paul Du Bois, engineer of the Orleans Railway Company of Paris, the author offers the following conclusions:

On the whole it seems to us that electric traction should at present be looked upon as a useful auxiliary to steam traction, capable of operating certain parts of railway traffic with advantage and economy. The principal cases in which its adoption may at present be feasible are: first, on lines which are chiefly underground, then on metropolitan and on suburban lines, on interurban lines of limited length and with much traffic, on railways with steep grades, and on lines which are worked up to their full capacity.

It is impossible to indicate in a general report in any more definite way the cases in which the system of working may lend itself to the application of electricity; it is essentially a question of degree, and each individual case requires special examination. In this examination special consideration must be given to the cost of the electric equipment, the principal factors of which are, in the first place, the conditions of working, the number and weight of the trains, and secondly, the conditions under which the line is built, its length, profile and plan; then the charges for interest and sinking fund of the capital outlay required must be compared with the economy which electric traction will give as compared with steam traction.

If it is a question of a new line, the adoption of electric traction may in certain cases result in a lower cost of construction, whereas in the case of existing lines the value of the rolling stock which will be rendered useless by the introduction of electricity has to be taken into consideration and written off.

Among the conditions in favor of electric traction are naturally the proximity of easily utilizable water power or of other cheap sources of energy, such as coal pits and blast furnaces.

In comparing the cost of traction, we must consider in the case of electricity, in addition to the eventual economy realized in the production of energy, the reduction of dead weight resulting from the smaller weight of electric locomotives, the reduction in the cost of driving and of maintenance, as well as the accessory economies capable of being effected in switching operations at stations, in lighting the stations and trains, etc.

Finally, if so happens, the increased receipts which may result from the improved service have also to be taken into consideration.

In any case, the problem becomes in the end a financial and economic one.

THE QUESTION BOX

The discussion on parks is continued, this instalment dealing mainly with park layouts and means of handling pleasure traffic. In the employees' department several managers explain their methods of employing extras, keeping employees' records, merit system used, etc. The live topics of franchises and municipal ownership are also treated, while bearing practice is the main subject in the master mechanics' department.

C.—PARKS AND PLEASURE RESORTS

C 8.—Please send description of general layout of your park theater.

Whalom Park has a complete theater devoted to opera. The seating capacity is 3000. The roof construction is such that there are only two posts in the auditorium, and these are 82 ft. from the stage. The sides of the theater are always open.

W. W. Sargent, Mgr. Whalom Park,
Supt. F. & L. St. Ry. Co., Fitchburg, Mass.

The features and dimensions of our casino at Idlewilde Park, Newark, Ohio, are as follows: Stage, 56 ft. x 56 ft.; fly scenery and fly gallery on one side, 52 ft. to gridiron; stage opening, 32 ft. x 28 ft.; eight dressing rooms on ground floor back of and opening off stage; casino proper, 90 ft. x 135 ft.; main center aisle and four side aisles; two exits each side; six pivoted swinging windows on each side, each 4 ft. x 15 ft.; main entrance, 8 ft. x 10 ft., directly in center of auditorium, opening into lobby; at the right and left of lobby are ladies' and gentlemen's retiring rooms and toilets; office is off lobby, with main entrance doors, 8 ft. x 15 ft., each side of office.

J. R. Harrigan, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

We have no large central theater in White City, but there are about half a dozen small ones, each seating about 400 people, in the various attractions.

Paul D. Howse, Gen. Mgr.,
The White City, Chicago.

Olcott Beach Theater has arrangements for seating audience in open air, only the stage being covered, and that is entirely open on its four sides, the roof being supported by four huge posts, the whole being finished in rustic style.

J. E. Stephenson, Pass. and Freight Agt.,
International Ry. Co., Buffalo.

C 9.—What do you think of the "new idea" in pleasure parks, i. e., having an enclosed area on the idea of "Dreamland" at Coney Island, where a small fee is charged for admission to the enclosure and where the attractions consist of a limited number of free shows, and a number of side shows or attractions to which additional admittance fee is charged?

Good idea where there is a population of sufficient volume to furnish the business.

W. W. Sargent, Mgr. Whalom Park,
Supt. F. & L. St. Ry. Co., Fitchburg, Mass.

If you are handling large crowds, and there are new faces every day, yes. Otherwise your park cannot support such a venture.

J. R. Harrigan, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

I consider the enclosed area on the idea of Dreamland at Coney Island to be the best.

Paul D. Howse, Gen. Mgr.,
The White City, Chicago.

This plan does not seem feasible, except where patronage will average 15,000 per day or over during the summer months. All the attractions are expensive, and require a big patronage to make them remunerative.

J. E. Stephenson, Pass. and Freight Agt.,
International Ry. Co., Buffalo.

Where there is a population of not less than 300,000 to draw from, or where there is a large transient patronage, such an idea appears to be practical and likely to produce good results.

I. W. Phelps, Mgr. Park Dept.,
Dartmouth & Westport St. Ry. Co., New Bedford, Mass.

The "new idea" in pleasure parks is an agglomeration of tinsel that dazzles the eyes, while it tires the senses of the patrons, and I believe will soon lose popular support.

Gaylord Thompson, Gen. Mgr.,
Beaver Valley Tract. Co., Beaver Falls, Pa.

This is the only way to run a park. The 10-cent admission fee insures something toward paying the enormous expenses necessary to give a show that will attract the people, and the writer fails to see how a park can be made to pay on any other plan.

G. A. Dunlap, Pres. and Gen. Mgr.,
Electric Park Amusement Co., Newark, N. J.

C 10.—Give suggestions, based on your experience, as to the best method of handling park travel.

Double truck, open or convertible cars run at the headway required.

W. W. Sargent, Mgr. Whalom Park,
Supt. F. & L. St. Ry. Co., Fitchburg, Mass.

For interurban traffic, in the forenoon: Do not overcrowd your cars. Do not keep passengers standing for long periods along the line uncertain as to what times trains will pass stopping points. Relieve long waits and allay dissatisfaction by running your trains on time. Operate your cars on as short a schedule as practicable, timing your service in accordance with your equipment and traffic. In the afternoon: Get a line on the number of passengers you will be expected to handle, send all cars that you think will be needed, and can be spared from regular service, to the place of congestion. Load as fast as demands call for and start out. Keep the cars moving. Avoid crowding, pushing and all disorder at loading and unloading. Guard every point and place along the line against accidents. For city traffic: Keep your cars moving in accordance with the traffic. Relieve all congestion immediately. If you haven't a loop, make one.

J. R. Harrigan, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

I believe it is a mistake to ever have a trolley line or any other transportation line enter a park. In my opinion, cars should run to the entrance but not inside.

Paul D. Howse, Gen. Mgr.,
The White City, Chicago.

Our Olcott Beach Park, on account of its location, does not attract a big patronage such as the average street railway park located within a short distance of a population center. For that reason we do not consider that our experience in the operation of a park or the handling of travel will be any guide to another railway company where the conditions are much different. The total attendance at Olcott Beach for the summer season is less than 250,000. The park is maintained in its natural state as far as possible, and the only amusement attractions are the rustic theater, where vaudeville performances are given; an electric riding gallery and miniature railway, the two latter being operated by the company.

J. E. Stephenson, Pass. and Freight Agt.,
International Ry. Co., Buffalo.

If vaudeville or light opera is at the park we find it expedient to have cars banked on side track in sufficient number to take the crowd home at one time in two directions immediately after the performance. For outdoor attractions, such as fireworks, the people are not so anxious to leave the park all at one time, and a regular string of cars, two or three minutes apart, can handle such crowds very well. In this way we have handled as many as 8000 people without confusion or accident.

Geo. H. Conklin, Park Mgr.,
Augusta-Aiken (Ga.) Ry. & Elec. Co.

Lincoln Park, owned by the Dartmouth & Westport Street Railway Company, is located midway between the cities of New Bedford and Fall River, Mass., the railway company connecting the two cities. The park receives its patronage from both cities. Starters in both cities watch the travel, and as soon as it becomes apparent that regular cars are not sufficient to handle the crowd, extra cars are called for. During the evening travel, which is always much in excess of day travel, the starter at the park keeps account of all passengers who get off at the park by deducting the number of passengers remaining on the car after car has unloaded from the number recorded on fare register. He is able from this to tell how many cars are necessary to have on hand when the entertainments close in the evening, and as he is connected with the car house by telephone, he is able to handle the crowd fairly well on ordinary days.

I. W. Phelps, Mgr. Park Dept.,
Dartmouth & Westport St. Ry. Co., New Bedford, Mass.

Where it is possible to do so, a pleasure park should be located about 3 miles from the center of population for small communities of, say, from 30,000 to 40,000 people, and in a location where heavy grades can be avoided. Under such circumstances the line from the park to the center of the city should be double track, with a loop at each end, so that it would be practicable to operate trailer cars. The converging point of the regular city line should be the point of transfer to the pleasure park, and such point should be fixed as the only place where transfers to and from the park shall be exchanged. GAYLORD THOMPSON, Gen. Mgr., Beaver Valley Tract. Co., Beaver Falls, Pa.

C 11.—What is the best form of car terminal at a park, with reference to preventing congestion of cars and crowds? Please discuss the theoretical and practical questions involved.

The best form of car terminal at a park would be some type of improved elevated terminal with turnstile and exit gates, but under ordinary circumstances the practical solution is to run cars enough to accommodate the people. We have a single loop at Whalom Park. W. W. SARGENT, Mgr. Whalom Park, Supt. F. & L. St. Ry. Co., Fitchburg, Mass.

We have a loop at the principal race track, and find this to be by far the most satisfactory way of handling a large number of cars within a given time. JNO. J. AKIN, Supt. Los Angeles Ry. Co.

Have a loop with high fences and one platform for unloading and another for loading the cars. Have storage tracks for extra cars to carry the crowd home.
FRANCIS G. DANIELL, New York City.

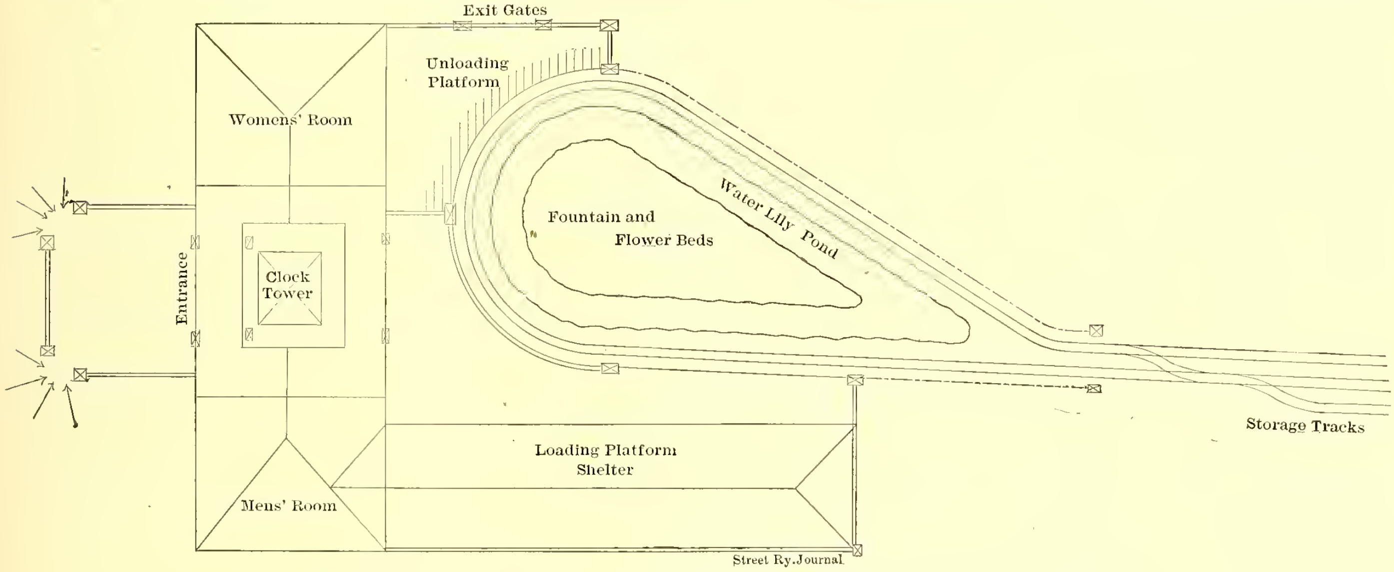
Have a loop by all means, if the situation is such that one can be used. We are located on a main line, and cars pass and repass our park in both directions, so there is no room for a loop.
C. A. DUNLAP, Pres. and Gen. Mgr., Electric Park Amusement Co., Newark, N. J.

Enclose your terminal with a high, strong fence (woven wire presents a neat appearance, and the effect is good). Arrange your exits and entrance gates in accordance with the lay of your track and the entrance to the park proper. Run your trains inside of this enclosure at all times and hold the people on the outside. A turnstile at the entrance will line up the passengers in a proper manner, and a guard back of this will keep order and prevent crowding and accidents. Announce by placards where the car runs (if you are operating several divisions) and what it connects with. When your car is loaded close the gate and start it out. Be sure that the car is unloaded at the entrance before it is brought around to the exit. Arrange that these two openings be placed far enough apart in order that the coming in and going out passengers will not meet. J. R. HARRIGAN, Gen. Mgr., C. B. L. & N. and C. N. & Z., Columbus, Ohio.

The car terminal at Olcott Beach is operated as a loop with storage tracks within the loop. This plan has been found very successful. J. E. STEPHENSON, Pass. and Freight Agt., International Ry. Co., Buffalo.

Our experience shows it is best to unload cars after they have come through chute, which is built so close to cars people cannot stand inside it. Extend chute to platform, which only can be used to load and leave park. These methods obviate the danger incident to passengers jumping off before the car reaches the station, and trying to board it while it is running..
GEO. H. CONKLIN, Park Mgr., Augusta-Aiken (Ga.) Ry. & Elec. Co.

The car line should terminate in a loop, and there should be a track for storing cars outside of the regular railway line. The unloading platform should be entirely separate from the loading platform. Where large crowds have to be handled, admission to the loading platform should be regulated by the capacity of the cars. Crowding should never be permitted on the loading platform itself. The best device for controlling large numbers of people that I know of is a high picket fence in the form of a rectangle, projecting out into the grounds from the entrance to the loading platform, from 15 ft. to 20 ft., with gates on the outside corners of the rectangle thus enclosed. This fence should be very strong, and heavy solid posts should form the gateway, with a stout chain to control the opening and an attendant to each gate. Very large crowds can be handled by this contrivance, with the least danger and inconvenience to the crowds themselves. If the outside pressure becomes too great upon the people standing at the gate, they can squeeze out at the sides, as the pressure is, so to speak, exerted against the point of a wedge. All funnel-shaped devices that tend to converge the people toward a narrow entrance and confine them there are extremely dangerous, and should be avoided. The sketch herewith will illustrate this idea, and is substantially the layout of the park terminal of Cascade Park, New Castle, Pa.
GAYLORD THOMPSON, Gen. Mgr., Beaver Valley Tract. Co., Beaver Falls, Pa.



ARRANGEMENT OF TERMINAL TRACKS AND BUILDINGS AT NEW CASTLE, PA.

C 13.—Based on the results of the past three seasons, has your park or attraction resort proved a profitable investment? Please give itemized statement of receipts and expenses in this connection.

Yes. W. W. SARGENT, Mgr. Whalom Park, Supt. F. & L. St. Ry. Co., Fitchburg, Mass.

Yes. J. R. HARRIGAN, Gen. Mgr., C. B. L. & N. and C. N. & Z., Columbus, Ohio.

As a separate investment, this company's park has not been profitable, but it is a necessary adjunct to the railway in attracting pleasure crowds for the trolley ride.
J. E. STEPHENSON, Pass. and Freight Agt., International Ry. Co., Buffalo.

We contemplate the abandonment of one of our parks and placing all attractions at Lake View Park next season. So far our parks have not proved a paying investment. So many factors are to be considered in our experience that it is impossible to say if our Lake View Park has been a direct profit or loss. It is situated on a regular line of travel, about three miles from the heart of the city, and, unless we are to have special attractions, only the ordinary schedule cars on the Lake View line pass it each trip.

Geo. H. Conklin, Park Mgr.,
Augusta-Aiken (Ga.) Ry. & Elec. Co.

The writer has had considerable experience with parks, where the gross receipts for the three summer months have amounted to $40,000, and where the expenses have been within two or three thousand dollars of this amount, the profit being in the induced railway travel, and enough has been earned in this way from such travel to almost pay the entire bonded indebtedness of the company.

Gaylord Thompson, Gen. Mgr.,
Beaver Valley Tract. Co., Beaver Falls, Pa.

Yes, our park has proved very profitable.

C. A. Dunlap, Pres. and Gen. Mgr.,
Electric Park Amusement Co., Newark, N. J.

B.—EMPLOYEES

B 17.—Have you any system of special rewards or prizes to conductors and motormen for meritorious service? Please give complete details of the system and the results secured.

We have no system of prizes for meritorious service.

E. J. Ryon, Supt., Schenectady Ry Co.

No.

J. R. Harrigan, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

We pay our motormen and conductors a dividend of 10 per cent on January 1 and July 1, on wages earned during the period of six months previous, the only condition being that the employee shall be on the list on the dates mentioned, not having been dismissed previously and not having resigned. The tendency of this prospective dividend is noticeably toward good service.

A. H. Rogers, President,
Southwest Missouri Electric Railway Company, Webb City, Mo.

We have recently adopted the Brown system of discipline, and all meritorious acts demanding special recognition of the company are suitably rewarded with credits. As the plan is largely in the experimental stage with us at present, we hardly feel competent as yet to express an opinion of its strong and weak points.

S. W. Cantril, Supt., Denver City Tramway Co.

B 18.—What is the best method of reprimanding and punishing employees?

I think there might be a great difference of opinion about the method of reprimanding and punishing employees. It is our practice to reprimand by bringing them to the office, and they are punished according to the nature of the charge. For violation of rules it is our practice to send the men to the foot of the extra list for a period of days, depending upon the nature of the charge.

E. J. Ryon, Supt., Schenectady Ry. Co.

Opinions differ as to the best methods of reprimanding and punishing employees. Only in extreme cases do we suspend employees for infraction of the rules, as it is our experience that a man who will not observe the rules by kindly talk and instruction will not do any better by suspension, and the company is better off to be rid of his services. A record is kept in the superintendent's office showing all reports as to violation of rules, accidents, register shortages, etc., and when a man is sent to the superintendent's office, his record is taken into consideration in the disposition of his case.

J. E. Duffy, Supt.,
Syracuse Rapid Transit Ry. Co.

In these matters we are governed by the circumstances of each case as to whether the punishment shall be suspension or dismissal. We have not adopted the practice of discipline by record, although we make use of some parts of the system.

J. R. Harrigan, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

We reprimand them verbally and suspend them from service for a given time.

C. E. Palmer, Supt.,
Cincinnati, Dayton & Toledo Tract. Co.

Bring employees into the office and have a good plain openhearted talk with them. Should the offense be grave enough for dismissal, post a bulletin notifying other employees the reason for such dismissal. Suspending a man is not good for him, his family, or the company. During the period of suspension he will ride around with the trainmen, complaining that he did not get satisfaction or fair treatment, and will try to create dissatisfaction among them. The family is deprived of his wages, and the company will be the loser in the end, especially if the suspended man is a conductor. Unless he is a hard-hearted, bullet-headed, ungrateful specimen of humanity, he will be very thankful to his employer for being lenient, when offense does not justify discharging, and for good advice given him when called into the office. The public soon hears of such a liberal and broad-minded policy in treating the men, and the result will be beneficial to the company in more ways than one.

G. E. Miller, Supt.,
Union Electric Co., Dubuque, Iowa.

We get the best results by calling them into the office, and having a "heart to heart" talk with them.

S. W. Cantril, Supt.,
Denver City Tramway Co.

B 19.—What do you think of requiring motormen to pay for damages caused by their carelessness?

In the first place it is unlawful in this State, and I know of no good results that this practice might bring.

C. Loomis Allen, Gen. Mgr.,
Utica & Mohawk Valley Ry. Co.

We have not yet required motormen to pay for damages caused by their carelessness; however, I believe that such a lesson touching their pocketbooks would be valuable.

E. J. Ryon, Supt., Schenectady Ry. Co.

We believe that in case where the damage is serious, motormen would seek employment elsewhere rather than pay. If the loss were trivial, other means of discipline would be more effectual.

J. R. Harrigan, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

I do not think it is a good plan.

C. E. Palmer, Supt.,
Cincinnati, Dayton & Toledo Tract. Co.

We do not think well of the plan, and believe that other forms of punishment are more suitable. Requiring a man to pay for damage caused by him often makes him an enemy of the company, with a desire to "get even." In a case like this the road would be better off without such a man.

S. W. Cantril, Supt.,
Denver City Tramway Co.

B 20.—Do you require conductors to make good shortages in their accounts and do you pay back to them any overages?

We require conductors to make good shortages, and overages are returned to them.

C. Loomis Allen, Gen. Mgr.,
Utica & Mohawk Valley Ry. Co.

We require conductors to make good all shortages, and we pay them back all overages.

E. J. Ryon, Supt., Schenectady Ry. Co.

Conductors are obliged to pay all register shortages, and all overages are returned to them.

J. E. Duffy, Supt.,
Syracuse Rapid Transit Ry. Co.

Yes.

J. R. Harrigan, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

They are required to pay shorts, and the company pays back any overage.

C. E. Palmer, Supt.,
Cincinnati Dayton & Toledo Tract. Co.

In both instances, yes.

S. W. Cantril, Supt.,
Denver City Tramway Co.

B 21.—What are you doing to better the condition of electric railway employees and create among them a spirit of greater loyalty to the company's interest?

This company has provided rooms for the employees with amusements, together with a suitable library where good reading matter may be had. We believe that our men, as a whole, appreciate this, and it has a tendency to create a better feeling among the men and between the men and the management.

E. J. Ryon, Supt.,
Schenectady Ry. Co.

Interesting ourselves in their well-being, hearing their suggestions and grievances, and seeking to create a feeling that their position is secure as long as they are attentive to duty.

J. R. Harrigan, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

We try to treat them as men, and promotions are made from the ranks.

C. E. Palmer, Supt.,
Cincinnati, Dayton & Toledo Tract. Co.

We are trying to create a better feeling and more loyal spirit to the company's interests by treating the employees as men. They are not expected to do the impossible, but to do all they reasonably can in the discharge of their duties. They are made to feel that it is to their interest as well as to the interest of the company to give the public a good service, to take care of company property and to avoid all accidents. They are never discharged until they have had a fair hearing. During sickness they are visited by the management, and shown in different ways that their good work is appreciated. The company has also built a trainmen's room with all the latest modern improvements for the benefit and comfort of employees. In a nutshell, respect for the workmen, fair treatment and a willingness at all times to meet the men, with grievances, individually, are very important factors in maintaining harmony between employer and employee.

G. E. Miller, Supt.,
Union Electric Co., Dubuque, Iowa.

We have assisted our men to equip attractive club rooms at each division house. Gymnasium and baths are also provided. The men often give literary, musical, athletic and other entertainments, and we believe that our efforts in this particular have been appreciated. Each trainman who is married, or who is the support of his mother, is given a complimentary book containing 30 car tickets each month, for the use of his wife or mother, as the case may be. All trainmen who have been in the employ of the company for ten years or more, receive a new uniform and cap each year, as a gift from the company. Some years ago we adopted the method of placing a star on each side of the uniform collar of our men, for each five years of service, and the plan seems to be well received. We believe that the ascending scale of wages has a tendency to hold good men, and that men desire to retain their positions to a greater extent than they would under a flat schedule. Our men are invited to be frank in stating their grievances, or in offering suggestions for the betterment of the service, and to such a courteous consideration is given.

S. W. Cantril, Supt.,
Denver City Tramway Co.

A.—GENERAL

A 25.—What are the salient points that go to make up an "ideal electric railway franchise"; one that would be absolutely fair to the public as well as to the company?

An ideal electric railway franchise should permit proper protection of the investment as the property grows, or as worn out or superseded apparatus is to be replaced; the company should be taxed little or nothing, and any excess of earnings over a fair interest on the actual investment should revert to the public in the form of reduced fares, which in turn would stimulate traffic and again reduce the fares.

Theodore Stebbins, Gen. Mgr., for Receivers,
The Appleyard Lines in Ohio, Columbus, Ohio.

One of them is a clause stipulating that cars shall be run as often as necessary to take care of the public, and no oftener, the schedule to be determined jointly by the railway company and the city officials. The most objectionable feature that can be inserted in the franchises of a street railway company, in our judgment, is a clause compelling the company to run a stated number of cars, or a clause compelling it to run cars every so often. Another objectionable feature is compelling the company to sell six tickets or more for a quarter, as the company may find after operating the road that this does not pay, and it is a difficult matter to do away with it.

J. R. Harrigan, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Tract. Co.

A 26.—Is it not true that if the capital invested in electric railways should be exempted from all special taxation, the public would be benefited through increased electric railway facilities?

It is true that all electric railways should be exempt from all special taxation. Whatever extra burdens are put onto street railroads the public has to pay for, either in increased fares or reduced service.

H. C. Page, Gen. Mgr., Berkshire St. Ry. Co., Pittsfield, Mass.

Yes; if the street railway management is fair with the public.

Theodore Stebbins, Gen. Mgr. for Receivers,
The Appleyard Lines in Ohio, Columbus, Ohio.

Yes. Money could be put toward improvements.

H. A. Tiemann, New York City.

A 27.—It is commonly held that electric railway companies should make some return to the local municipality in exchange for the right to use the streets. What is the fairest basis upon which this compensation can be accomplished?

The same rule would apply to this as to A-26, that if companies pay to local municipalities a tax, the extra expense put onto the companies would have to be made up by increased fares or poorer service.

H. C. Page, Gen. Mgr.,
Berkshire St. Ry. Co., Pittsfield, Mass.

The advantages of street railway accommodations and trade brought to a town are sufficient to pay for use of streets.

W. T. Nary, Supt.,
Hoosac Valley St. Ry. Co., North Adams, Mass.

We would simply say that the street railway company should give good service and not be compelled to pay any per cent of its gross earnings or net earnings to said municipality.

J. R. Harrigan, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Tract. Co.

Sprinkling streets and maintaining pavement for 3 ft. outside of tracks.

H. A. Tiemann, New York City.

I believe that electric street railways should be taxed at no greater or less rate than other property interests of a community. Good service is of more importance to the public than poor service with higher rate of taxation. When a street railway company pays for a certain portion of the paving of a street, it does more than almost any other interests which use the streets. The streets are public property and for the public good, and good street car service is of as much importance to the public as any other purpose for which the streets can be used.

S. W. Cantril, Supt.,
Denver City Tramway Co.

A 28.—Is a franchise tax a fair and just method of taxing electric railways? Give the reason for your opinion.

A small franchise tax is the fairest and most feasible way of handling this tax question, as it puts a company on a business basis with a community, and gives it something for an argument to meet criticism that the street railway company is getting everything for nothing.

H. C. Page, Gen. Mgr.,
Berkshire St. Ry. Co., Pittsfield, Mass.

We do not believe a franchise tax is fair and just, because there is no uniform way of determining the value of a franchise. The franchise itself may have no value; it is simply a special privilege from the use of which may or may not accrue profit. It is used by unscrupulous politicians to force excessive taxation upon certain companies for political or illegal purposes.

S. W. Cantril, Supt.,
Denver City Tramway Co.

A 29.—What, in concise form, are the best arguments that can be brought to bear in favor of private ownership of electric railways when a community is being agitated with the municipal ownership theory?

Show them receipts and operating expenses after a blizzard.

W. T. Nary, Supt.,
Hoosac Valley St. Ry. Co., North Adams, Mass.

Municipal ownership of street railroads is not practical. A street railroad cannot be operated as economically by cities and towns, as the men who dictate the policy of the road would not be practical men. It has taken years of experience and study for the men that are in the business to bring the street railroads up to the present high standard. Politics could not be kept out of the management, and this, of necessity, would hamper the operator. If the cities owned and controlled the road, each citizen would feel that he had a certain amount of claim on the property and would demand that his ideas should be considered.

H. C. Page, Gen. Mgr., Berkshire St. Ry. Co., Pittsfield, Mass.

Incompetency of any municipality to manage a business requiring so much specialized skill, and whose development is still under such rapid evolution.

THEODORE STEBBINS, Gen. Mgr. for Receivers,
The Appleyard Lines in Ohio, Columbus, Ohio.

Our opinion of municipal ownership is that it is not a success, for the reason that you cannot keep politics out of it. If this could be done we might recommend it, but it is not possible. The records of municipal ownership would bear us out in this argument.

J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Tract. Co.

The failure of most of the municipally-owned railways throughout the Old World is enough to demonstrate to an impartial and thorough investigator, that municipal ownership is a farce, not to say an expensive luxury. I believe that a strong organization of railway men should be perfected to gather data on the failures of municipal street railways and public utilities throughout the world and have same published from time to time in influential publications of the United States, as there is no subject upon which the public is so largely misinformed as that of "municipal ownership."

S. W. CANTRIL, Supt.,
Denver City Tramway Co.

A 30.—Is it true that a properly regulated monopoly of street railway interests in any community is conducive to the best service of the public? Please give your reasons for your answer.

It is true that if street railroads are consolidated and owned by one interest in any community, the results will be conducive to better service for the public. This is made possible by making better connections at connecting points, and issuing transfers from one line to another, and working in harmony at all times.

H. C. PAGE, Gen. Mgr., Berkshire St. R. Co. Pittsfield, Mass.

Yes; a property regulated monopoly can undoubtedly furnish the best service, because more universal transfers can be issued, competitive extravagances avoided, duplication of management expenses avoided, and business on a larger scale permits specialized economies.

THEODORE STEBBINS, Gen. Mgr. for Receivers,
The Appleyard Lines in Ohio, Columbus, Ohio.

Yes. Because the roads, if under one control, can be operated cheaper; consequently better service is obtained.

J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Tract. Co.

Yes. Consolidation of various railway properties in a city causes in many cases universal transfers, one line operating in harmony with others, and reduction in operating expenses. For this last named reason better service can be given.

H. A. TIEMANN, New York City.

Certainly. Competition in the street railway business never resulted in permanently lower fares in any community. On the other hand, the placing of all lines under one company has always resulted in lower fares in consequence of the extension of transfer privileges and the enlarging of the 5-cent zones.

ANONYMOUS.

Yes, because it means universal transfers, and routes of cars can be arranged to better advantage.

FRANCIS G. DANIELL, New York City.

Since the consolidation of all the railway interests in Denver the public has been benefited by a universal transfer system, whereas, before, the system of transfer was confined between the two companies. Some of our lines have been re-routed and the entire city enjoys a better service than ever before. Not one citizen in five hundred would willingly go back to the old days of competition and independent companies.

S. W. CANTRIL, Supt.,
Denver City Tramway Co.

E.—THE MASTER MECHANIC'S DEPARTMENT

E 16.—What is the best form of handle for trap-door lifts in cars?

Iron stirrup dropping down through trap door, flush with top surface.

J. CHAS. ROSS, Gen. Mgr.,
Steubenville (Ohio) Tract. & Lt. Co.

A good wrought-iron ring fastened with a staple clinched through the floor. This should not project above the slats on the floor. The usual cast-iron flush rings are continually breaking if any extra strength is used to raise the trap.

FRANCIS G. DANIELL, New York City.

E 36.—For armature bearings, which form of lining do you prefer, babbitt or brass? Please give your experience with either.

The results of a little experience with brass armature bearings have not shown as good mileage as babbitt metal.

MASTER MECHANIC.

Have had good results with babbitt.

FRANCIS G. DANIELL, New York City

E 37.—What has been your experience with casting babbitt bearings in your own shops? Do you consider it profitable to do so? Please give statement of costs in this connection.

We cast our own bearings. It was our practice, formerly, to sell old babbitt metal at half value. We found, however, that by adding 5 per cent of tin to our old babbitt metal, melting it down, and adding sal ammoniac, we could get a metal equal in color, strength and hardness to the new metal we were buying. This has reduced our babbitt metal bill considerably.

Schenectady Ry. Co.

It certainly is a money-saving operation to re-babbitt your own bearings.

FRANCIS G. DANIELL, New York City.

E 38.—What formula for babbitt metal do you consider satisfactory?

A babbitt metal that has given excellent service is made by the following formula:

	Per cent
Tin	63
Lead	25
Antimony	9
Copper	3
Total	100

MASTER MECHANIC.

The writer prefers the formula known as genuine babbitt, *i. e.*, 25 parts tin, 2 parts antimony, 5 parts copper.

FRANCIS G. DANIELL, New York City.

E 40.—Do you consider it necessary to bore babbitt bearings after pouring? Why?

It is necessary for all bearings to be bored to fit shafts that have been in use, as shafts wear unevenly and different shafts will not fit castings from the same mandrel.

MASTER MECHANIC.

No, if shafts are sufficiently uniform in diameter, so that a good fit can be obtained without boring.

FRANCIS G. DANIELL, New York City.

E 41.—Please describe your method for boring babbitt bearings.

We have a special jig for boring bearings. The jig is used in a regular turning lathe and is adjustable so we can obtain an exact radius to fit any size of axle.

Schenectady Ry. Co.

Bearings to be bored are held in a split chuck having the parts hinged on one side and bolted on the other. The chuck is bolted to the face plate of the lathe. With this chuck bearings can be quickly clamped and no time is necessary for truing up, as the chuck has been accurately fitted to the lathe.

MASTER MECHANIC.

E 42.—After the armature shaft has become worn, how do you insure good fit at the bearings?

Bearings are bored to a snug fit on the shafts by caliper measurements. If the shaft is worn taper, it is turned straight before any attempt is made to fit the bearing to it.

MASTER MECHANIC.

CONVENTION OF THE IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION

The Iowa Street and Interurban Railway Association held its second annual convention at Dubuque, Iowa, April 20 and 21, 1905. The meetings were held at the Julien Hotel.

The first meeting was called to order on Thursday morning, April 20, by President George B. Hippee, of Des Moines. J. R. Lindsay, of Dubuque, secretary and treasurer of the Union Electric Company, welcomed the association to the city. The minutes of the first meeting held last year at Des Moines were then read by Secretary L. D. Mathes, of Dubuque. This was followed by the president's address.

President Hippee referred to the early history of electric railroading in Iowa, as Dubuque, Davenport and Des Moines were among the pioneer cities in which electric railway installations were made, and to the necessity for progress. "To keep our place," he said, "we must not only keep abreast of the times, we must lead. We must discard the old and adopt the new, or else be ground under the wheels of progress." He referred to the value of an association such as was then in convention, to progress and to the importance of all participating in the meetings. They only occur once a year, and are of value only as interest is taken in them. In closing, he extended his thanks and those of the association to the members of the executive committee, and especially to the very efficient secretary.

Secretary Mathes made his report, which showed that only a few of the companies of the State were not represented in the association. He asked the present members to induce those not already in the association to join, as they were sure to derive much benefit from membership.

This report was followed by the reading of a paper entitled "Handling of Freight by Interurban and Interchange of Business With Steam Railroads," by H. H. Polk, president of the Interurban Railway Company, of Des Moines. This paper is published in abstract on page 784.

After reading the paper, and in answer to a question, Mr. Polk said that his company had a regular freight warehouse in Des Moines, which is now a room in a car house near the heart of the city. But this warehouse is getting too small and the company intends to build a regular freight house soon. Most of the carload freight consists of cattle and grain. The company has joint traffic rates with some, but not with all railroads. It gives the shipper a bill of lading all the way through to any point to which the company has traffic arrangements. If a farmer wishes to ship live stock to Chicago, he orders a car from the Chicago Great Western. The Interurban Company takes this car to one of its stock yards, where it is loaded, and it is then hauled to Des Moines for shipment over the Great Western. There are six stock yards in 26 miles, so that they are handy for the farmer. Collections of freight charges are made in advance and settlement is made with the connecting road at the end of each month. The company also has a joint rate on passenger ticket sales, so that tickets can be purchased at the company's stations to any place in the United States. The company is doing the same business as a steam railroad, only it is operating its cars by electricity.

The point was further brought out by Mr. McDonald, of Waterloo, that in his locality nearly all shipments are made on certain days of the week because of the idea of one of the farmers and shippers that the market was best on certain days. This made it difficult to handle stock shipments by electricity, because of the long trains necessary. Mr. Polk, however, stated that at Des Moines the stock business is fairly well distributed over all days of the week.

F. J. Hanlon, of Mason City, told of a Chicago commission house which sent out circular letters to shippers guaranteeing as good a market in Chicago on what used to be considered the off days as on any day of the week. This will tend to relieve all congestion of stock freight at both the farmer's and the Chicago end of the line.

After further miscellaneous discussion of freight traffic and interchange of business with the steam roads, the convention adjourned to meet Thursday afternoon with the Iowa Electrical Association, an electric light managers' organization, and to hear a paper by W. E. Boileau, engineer of the Union Electric Company, of Dubuque, on "Steam Turbines."

After listening to this paper, the street railway members left the convention hall to visit the new power house of the Union Electric Company, where Curtis steam turbines are in use.

In the evening an orchestra concert was provided for entertainment in the Hotel Julien lobby by the courtesy of the National Electric Company.

Friday morning the first business transacted was the appointment of a nominating committee, consisting of Mr. Kirk, of Sioux City; Mr. Leussler, of Council Bluffs, and Mr. Hanlon, of Mason City.

The secretary was instructed to publish the proceedings of the association. It was announced that the Union Electric Company would entertain the delegates at lunch at the Dubuque Club at 12:30 that day. The motion was carried that a legislative committee of five be appointed by the president. The president announced that this committee would be appointed later. R. A. Leussler, of Omaha and Council Bluffs, then read his paper on "Accounting." This paper is published on page 785 of this issue.

L. D. Mathes, of Dubuque, asked if any member could suggest a means of overcoming the trouble of having a great flood of passengers from all walks of life riding on half-fare workingmen's tickets during the rush hours where the company's ordinance specified that half-fare tickets shall be good at those hours for workingmen. These workingmen's tickets were used by all classes, whether workingmen or not. Was there any recourse?

J. F. Lardner, of Davenport, thought there was but one recourse, and that was to get the ordinance changed. There was no justice in adding to the company's rush-hour traffic by extra cheap tickets at the very time when the crowd is greatest in any event.

J. R. Lindsay, of Dubuque, said that the company at Dubuque was the one referred to by Mr. Mathes, and explained that the company accepted this ordinance because at the time the franchise extension of the company was being considered a number of ordinances were proposed which had many very objectionable features. They were able to compromise the matter by offering these half-fare tickets during the rush hour, and he thought it was a choice of the least of several evils. It made many people ride who otherwise would not, and caused the cars to be crowded with standing passengers where otherwise they would be able probably to give everyone a seat, and in Dubuque he did not consider this as such a great hardship on the company as some of the other provisions suggested when the franchise ordinance was being considered.

The paper written by John D. Fish, of the Tri-City Railway Company, Davenport and Rock Island, was then read, in the absence of its author, by J. B. Mendenhall. This paper appears on page 786.

Mr. Hippee then asked as to why red gum wood was specified for floors. Would it not warp?

J. F. Lardner, of Davenport, answered that if well-seasoned this wood would not warp, and wore well; it was a good imitation of cherry. He explained that Mr. Fish's paper described the construction used on forty cars which had been built by his company in Rock Island. These cars were 42 ft. over all, with 31-ft. bodies, and weighed about 40,000 lbs. The company had started building its own cars because it had been difficult to get deliveries of cars from car builders at the time they were wanted when this work was done. He believed also it was cheaper after once they were started. The future cars of the company would probably be somewhat lighter in weight. They bought as dry wood as possible and dried it in the kiln if necessary. The cars are the type in which the windows are removed in summer, so that the window pockets do not leave a place to catch refuse, as the latter is very objectionable.

Mr. McDonald, of Waterloo, said that his company had also found drop windows not satisfactory for the same reason.

The discussion drifted into one of semi-convertible cars versus double equipment of closed and open cars. Davenport and Des Moines men favored the semi-convertible equipment that could be used the year round. Clinton and Omaha men favored the double equipment. It was admitted that the open car is more productive of damage claims than the closed car, but was popular because of its carrying capacity and ventilation in hot weather. Opinions differed as to which car was the more easy to collect all the fares from when crowded.

The question was raised as to handling of crowds at parks and the use of turnstiles.

President Hippee said that at the State Fair grounds his company formerly used turnstiles to control the crowd at the terminal. Now the crowd is controlled by gates. Tickets are purchased immediately before entering cars. Tickets are good only on date of sale. The crowd is let through the gates as fast as seems best, and after passing through the gates they buy tickets on the way to the cars.

Mr. Leussler said his company had four turnstiles at its Lake Manawa terminal, but on days of largest crowd they had to close the turnstiles and open the gates wide so as to prevent passengers getting hurt by being pushed into the turnstiles by the crowd behind.

F. McDonald, of Waterloo, read his paper on "Rural Railways." This paper is published on page 787.

In the discussion, Mr. Hippee, Mr. Polk and Mr. Hanlon all agreed heartily with Mr. McDonald on the desirability of securing at first a 100-ft. right of way. The cutting of grass and weeds along the right of way will be done by farmers for the sake of the hay. The first cost of a 100-ft. right of way is but little more than for a 60-ft. right of way.

The president called on H. H. Clarke, of the Fairbanks-Morse Company, to say something on gasoline motor cars. Mr. Clarke said he had attended the convention to get the ideas of the railway men as to what they wanted in the shape of a gasoline car. He spoke briefly of the Prouty-Peirce car; the car operating on the Tabor & Northern Railway; the Union Pacific car; the Chicago, Burlington & Quincy car; the Hicks car, and finally of the very light Fairbanks-Morse cars. One had been built to seat nine people, and soon one would be out to seat twenty-five passengers. President Hippee said it seemed as if a gasoline car must come, but he thought it best to carry the passengers in a separate trail car.

The convention adjourned to be the guests of the Union Electric Company, of Dubuque, at an elegant luncheon served at the Dubuque Club.

The executive session closing, the convention was held over coffee and cigars at the lunch table. The nominating committee reported in favor of continuing the first year's officers another year, and this was done. The officers are: George B. Hippee, of Des Moines, president; J. F. Lardner, of Davenport, vice-president, and L. D. Mathes, of Dubuque, secretary and treasurer.

The hospitality of the Union Electric Company as carried out by J. R. Lindsay, secretary, and L. D. Mathes, general manager of the company, left nothing to be desired and was the subject of many complimentary remarks, both formal and informal. Hearty acknowledgement of it was made at the close of this meeting. The next convention will be held at Des Moines in April, 1906.

THE ELECTRIC RAILWAY FREIGHT SERVICE*

BY H. H. POLK.
President and General Manager Interurban Railway Company, Des Moines.

It is only within the last three or four years that electric railway men have waked up to the fact that there might be some money made at the freight business. Even to-day the majority of them will not consider the idea at all. They are contented with the passenger business alone. The one great reason for this is the fact that electric railways when first built were nothing more nor less than street railways extended into the country. Within the last few years, however, the modern electric railway is being built on steam railway standards. This means low grades, minimum curvature, heavy rails and bridges and the private right of way. The private right of way enables the electric railway to run its cars at any rate of speed it desires, to haul any kind of freight, and eliminates the great majority of accidents caused by collisions with teams and vehicles.

It seems to me that steam railways, with few exceptions, are very short-sighted in refusing to recognize electric railways in the interchange of freight. They cannot by this policy stop the building of electric railways. The latter are here to stay, and each year sees more of them in operation. The steam railways that publish joint rates with electric railways and are willing to grant a division of the rate will get all of the foreign shipments which originate on the line of the electric road, and there are many instances where the electric railway taps a new territory, one to which the steam railroad has heretofore never had access. The electric railway should have a traffic arrangement with some connecting steam railway in order to do a successful carload business, for if they do not have this the rate from a point on their line to a point on the steam railway would be the sum of the two locals, and therefore prohibitive. A. B. Stickney, president of the Chicago Great Western Railway Company, says that he does not care how freight is brought to his road, whether in a wheelbarrow, stage coach, horse car or by an electric car, he will take it and be willing to pay a little something to get it. This is the broad-minded view of this question. It is generally conceded that the electric road is more popular with the farmer. It is more profitable to him to ship over the electric railway than over steam railway, as the electric railway gives him more rapid, frequent and fully as reliable service, enabling him to receive and ship freight, mail and express at almost any hour of the day. The farm takes on a new aspect and becomes capable of being used in many ways otherwise impossible, part of the benefit of which will, of course, accrue to the railroad.

It should be the policy of electric roads to put in side tracks, stock yards and loading chutes wherever it is shown that they will be used. Stock can then be loaded on the farm without driving them 7 miles, 8 miles or 10 miles to some steam railroad station. The shipper saves the resulting shrinkage and has his choice of the steam railroads in the large terminal cities, enabling him to obtain the lowest rate and the shortest route. After deciding upon what road he desires to ship, he has merely to notify the electric railway and he will be supplied with a car from that road. He can also ship in tile, coal, machinery, feed, etc., and have these cars set upon his siding, eliminating the long haul from the railroad station. Is it not true that these advantages to the farmer will give to the electric railway the majority of the business it can handle? Much the same thing is true of the small cities and towns through which these interurban lines run. The merchant can easily order by telephone from the wholesale houses and within an hour or two the goods so ordered are in his store. He is not required to have so great an investment in his stock and is

* Abstract of paper read at the meeting of the Iowa Street and Interurban Railway Association, at Dubuque, April 20-21.

able to cut down his insurance, so that he, too, is glad to make use of the electric freight service.

Concerning rates, until 1887 nearly every large railroad had a classification of its own, but now most business is handled by one of three classifications. These are the official classifications used in the Eastern, the Southern and the Western States. In several States—Illinois, Iowa, Georgia and some others—there are classifications prescribed by the State Board of Railroad Commissioners applying to freight carried entirely within the State. The electric railways should use the classification which is used by the steam roads in their territory. In this State the roads should govern business within the State according to the Iowa classification. On interstate business the Western classification should apply. It is my opinion that the electric railways should adopt a rate which is possibly 5 per cent lower than the Iowa classification. The rapidity and frequency of the service does a great deal towards getting business for the electric road, but if we can say to a shipper that our rates are less than the Iowa classification, it is just that much more attractive to him.

A well organized freight department is, of course, of primary importance, and I will attempt to outline the methods used by our company in this department.

We have a general freight agent and two clerks in the general office. We also have a local agent at our freight house in Des Moines and an agent at each of our stations on the line. The great volume of freight business done by steam railroads is conducted by the use of a few business papers, and the records kept are complete and very simple. In the electric railway freight business still fewer papers are required. We use the regular shipping ticket that is used by all steam railroads. This is filled out by the shipper in duplicate, the agent receipting the original and retaining the duplicate from which he makes up his way-bills. The way-bills show the station from, the destination, the date, car number, car initials, consignor and consignee, number and description of articles, weight, rate and charges. They are sent to the freight auditor each day by the agent, and he enters them in his "freight forwarded book." The agent also makes out an expense bill in duplicate for each consignment on the way-bills for all freight billed from his station. The expense bill gives the names of the consignor and consignee, station from, destination, car number, car initials, number and description of articles, weight, rate and charges. The conductor takes the expense bill instead of the way-bill, as is customary on steam railways, and delivers it to the agent at destination, who in turn checks the freight delivered from them. The expense bills are then entered in a book called the "freight delivery book," in which the consignee receipts for the shipment delivered to him. When the charges are paid, the agent signs the original and gives it to the consignee for his receipt, and the consignee signs the duplicate, which is retained by the agent. The agent is required to remit to the treasurer daily all money, together with all duplicate expense bills, whether dead-head, prepaid or with charges, for freight which has been delivered. A duplicate of these remittance sheets is retained by the agent. The original remittance sheet, with all original expense bills and money, are placed in a heavy manila envelope, which is sealed with wax, and sent by "railway mail" to the treasurer so as to reach the general office before 5 o'clock p. m. In this manner we can tell at the end of each day how each agent stands in his accounts. This system was adopted for two reasons—first, that we wanted all accounts kept in the general office, and second, that we could handle the freight and accounts at each station much cheaper than we could by any other system, and we have found this to be very satisfactory.

The greatest difficulty we experienced in developing our freight department was in convincing the public that we could handle any kind of freight, from a small package to a carload of live stock, grain, lumber or any other commodity. However, this did not take very long, and to-day they know that we can handle anything a steam railroad can.

In order to do a successful freight business it is necessary to "get out" after the business or someone else will get it. Solicit your business, not only from the farms through which your road runs, but also from as far away as it is possible to draw it. The amount of business obtained by a good solicitor 5 miles or 6 miles away will astonish you. Do not be content to work up business in the country alone. Do so in your cities and towns. See that your freight solicitor makes regular calls upon the merchants of the smaller towns, the dairy concerns, wholesale houses, etc., in the cities. Find a market for the products of the farm, such as dairy products, poultry, fruit, vegetables, etc. Encourage all of these lines and the freight business will rapidly grow.

A report of the Department of Commerce and Labor for the year 1902, in a general discussion of the characteristics and significance of interurban service, says: "It is difficult to avoid entrance into the domain of prophecy. Some of the electric railways have already made such progress in methods that certain prophets look forward to the complete superseding of steam traction by electric traction. However this may be, it is evident that, even if the electric railways confine themselves to the methods already widely prevalent, they are bound to become a social and economic factor of enormous importance. Remarkable benefits have already been realized from the existing interurban lines, and the extension of such railways to a large proportion of our more prosperous communities seems but a matter of a short time."

ACCOUNTING AS AN AID TO THE OPERATING DEPARTMENT*

BY R. A. LEUSSLER,
Secretary O. & C. B. Street Railway Company

The science of accounting has many functions to perform; but as this paper is addressed, not to a body of accountants, interested in all the various phases of the subject, but rather to a body of operating men interested in accounting only in so far as it can be of assistance to them in operating their properties, I shall endeavor to confine myself to such parts of it as are, indeed, an aid to the operating department.

First of all, then, what does the operating man want to know from the accounting department?

As the success of every railroad enterprise depends necessarily upon the relation between the earnings on the one hand, and the expenses and fixed charges on the other, every operating man is naturally interested in increasing the former and keeping at their minimum the latter, and, therefore, what he principally desires from the accounting department is detail information concerning earnings and expenses. Just how much of this detail information he wants or needs, depends upon the size and individual characteristics of the property, and also upon the personal views and methods of the operating man; principally, however, upon the size of the property. If the system is so small that the operating man can easily keep in close personal touch with every part of it he can dispense with a great deal of the detail accounting without which the operating man of a larger property would be absolutely lost. In fact, a very small system would not be justified, from the standpoint of economy, in going too much into detail in its accounting.

Beginning now with the passenger earnings, it is important that the accounting should determine accurately—first, the actual or true earnings of each separate line each day, and second, the number of car-miles and the number of car-hours made on each line. To arrive at the actual or true earnings,

* Paper read at meeting of the Iowa Street and Interurban Railway Association, at Dubuque, April 20-21.

only the fares actually earned, or collected by conductors, should be treated as earnings; when ticket sales are treated as earnings, the showing is incorrect to begin with, and of no value whatever for purposes of comparison, especially if ticket sales are large and fluctuate greatly.

A record should also be kept showing the weather conditions, unusual attractions, and any other causes or conditions which affect passenger earnings, either beneficially or detrimentally. With this information at hand, a daily comparative statement of passenger earnings should be prepared showing the earnings, car-miles, car-days and earnings per car-mile and per car-day, of each line, together with a comparison of the same data of the corresponding day of the previous year, and this statement should also show the increase or decrease in the earnings of each line, the percentage of such increase or decrease in the earnings of each line, and the weather conditions, unusual attractions, etc., for both days compared. By "corresponding day of the previous year" is meant, not the same day of the month, but the same day of the week which corresponds most nearly with the day of the month. A like statement of passenger earnings should be prepared weekly, monthly and annually.

From a careful study of these statements the operating man should be enabled to draw certain deductions of great value to him in running his road. For instance, the "increase" and "per cent of increase" columns gage accurately for him the growth of traffic on the different lines, and the "earnings per car-mile," and "earnings per car-day" indicate the relation between the traffic and the service. This information puts him in a position to judge intelligently the needs of the different lines in the matter of service, particularly if these statements are supplemented by a further statement showing graphically the number of passengers carried on individual cars of each line during the rush hours. By observing the increase above the normal on days of special attractions, such as conventions, excursions, parades, etc., he can get a tolerably correct idea of the value of such attractions, and can know how much effort or financial encouragement he is warranted in giving towards securing such attractions.

Of assistance to him also in detecting peculating conductors is a "conductor's percentage sheet" showing the ratio of each conductor's collections to the earnings of the line on which the conductor is employed, and the ratio between his transfers and cash collections. If this is faithfully followed up it helps very materially in weeding out dishonest conductors, as it points out all irregularities in collections, and leads to investigation of the causes thereof.

Passing now to the operating expense accounts, we enter a very broad field, in which there is no limit to the amount of detail accounting that can be indulged in. The standard classification of operating expense accounts, as formulated by the Street Railway Accountants' Association of America, embodies thirty-nine accounts; but these can be subdivided to one's heart's content. One company with which the writer was connected for some years has in use a classification embodying something like one hundred and fifty accounts, and another road of which he has knowledge uses a classification containing something over two hundred accounts. The number of subdivisions of operating accounts must be decided with reference to the size and needs of the road; but as the greatest benefits to be derived come from comparing notes with other roads, the advantage of conforming to the standard system should not be overlooked. However, whatever classification be used, a monthly statement should be prepared showing a comparison with the same month of the previous year, the increase or decrease in the different accounts, the per cent of such increase or decrease, the amount of each account per car-mile and per car-day, and the ratio each classified expense bears to the receipts.

In addition to this the monthly statement should also contain some data concerning the power station, as the cost of power is a very important item of expense and one which is very susceptible to economies under proper handling. Assuming, of course, that the power station is equipped with a wattmeter, the monthly statement should show the number of kw-hours produced, the cost per kw-hour, the number of pounds of coal consumed per kw-hour, and also the number of kw-hours consumed per car-mile traveled. With such a statement before him, the operating man is enabled to make an analytical study of the various items of operating expense, and to measure the efficiency of his various departments, with a view to strengthening the weak places and attaining a higher degree of economy in operating.

CAR-SHOP METHODS*

BY JOHN D. FISH,
Master Mechanic, Tri-City Railway Company, Davenport

The reason for going into the building of cars has been, first, to cheapen the cost of cars; second, to build a car suited to the different needs of lines operated, and third, to standardize all of the parts so that the cost of repairs may be as low as possible. Where a variety of cars is used, a great deal of hand work is required in their repairing, but if all the cars are built on the same lines, much if not all this is done away with. The same lines have been followed as far as possible; at the same time the mechanics employed are familiar with all of these parts and do better and quicker repairing, and this is worth some consideration.

A number of all the parts which go into the cars is kept in stock at all times, ready to repair with at once. Sash and doors are oiled and varnished, and the small amount of fitting can be done very quickly. Siding is painted all but the last coats to go into broken sides or ends of the cars. The type of car being built is a semi-convertible 31-ft. body, seating forty-four people, with a maximum standing load of about 150. This type was chosen to do away with the expense of changing in the spring and fall. The windows come out entirely and are not used in the summer.

In building these cars only the best of lumber was used, but we find that timber cut locally will work in and save about one-third the cost of the lumber. It will be used in greater amount in the cars we build in the future.

The bottom framing is of long-leaf yellow pine, except the end sills and bolsters, which are of hard white oak, to give better support to the bolts used in them. If yellow pine is used the heads draw down and leave the platform loose; and it is hard to find any remedy for this trouble. The intermediate sills are mortised into the cross sills to give a continuous sill for tieing the side sills. No tie rods are used, but angle plates are bolted to the ends of cross sills a little back from the end to draw shoulder of tenon tight to side sill. These bolts may be tightened from time to time and keep the tenon from starting. The corners of side and end sills are treated in the same way, with the addition of a tie plate bent edgewise at right angles and bolted to the under side of sills.

The body bolsters are built up of two steel Ts with white oak fillers. This is not as strong as the standard bolster, but the car has to be kept as low as possible on account of low headroom of bridges and viaducts.

The floor is double; lower, yellow pine; upper, red gum, with a filling of building paper to keep the dust and noise out. The floors are laid diagonal, which gives great strength to the lower

* Paper read at meeting of the Iowa Street & Interurban Railway Association, at Dubuque, April 20-21. The Tri-City Railway Company has been building its own cars for several years. On account of unusual traffic conditions, the company requires a car with low roof and abnormal carrying capacity, as thousands of workmen are carried morning and evening to and from the Government works at Rock Island. The car which the company now uses is the result of Mr. Fish's design, and has not only proven entirely satisfactory at Davenport, but has attracted a great deal of attention in neighboring sections of the country.—[EDS.]

frame and prevents distortion in collisions. It is not as easy to repair, but this is not very important, as the wear is taken up by maple strips in the aisle space.

The upper frame work is of the best heavy white ash only; all light and brash wood is used for other work. All rails and plates are strap bolted to corner post to prevent tenons from loosening. To keep the posts from loosening at the bottom, by the pitching of the car body, a brace is gained and bolted to the posts just below the arm rail and to sill. The upper rail or top plate is double. As the inner is the thickness of the wood carline smaller than the outer part, it gives a bearing for the carline and keeps it up to place. Each half has its own mortise, making a double tenon on the post. The belt piece is gained for the post and rebated to set under top plate. All tenons in the cars are pinned with white oak pins, after clamping up. Draw pinning is not used, as it breaks the tenons out.

In getting out the rails long ash was used, but we found it too expensive, and used short ash, making a long scarf, gluing and screwing them together. No trouble has been found with these joints as yet. Steel carlines are let in between the wooden ones at each post. A stiff, springy steel is used for this purpose.

A single thickness of beaded siding is used, and scrim, well glued, stands as well as two, with much saving of weight.

The upper and lower trusses each have two turn-buckles to take up the slack. In this way about the same strain can be put on each end of the truss.

The vestibules open only on one side. The doors were made narrow to keep passengers from falling in getting off; it is inconvenient in the rush hours, but seems to prevent accidents. The platform knees are of white oak, trussed by two rods running each side of both outside knees, from lower corner to center of support, and down to lower corner at the other end of the knee. This gives a strong truss, and the whole platform can be lifted back to place, when sprung down. A truss is also used on the side which is closed, running from the platform end sill up to corner post to car body, and down on inside to sill. This is to help support the heater, which is on this side in the winter. Hard maple flooring is used in the vestibules, as yellow pine cuts out too quick.

In the interior of the car we have used cherry and mahogany, with maple head linings, but now are using quartered white oak, and it is giving better results as to wear and looks than the mahogany, and only costs about one-half as much. The sash are held in place by metal strips edged with rubber to keep the weather out.

In painting, we are using the lead system in the following way:

First coat—Lead and oil.
Second coat—Lead and oil with tint.
Third coat—Clear lead with tint.
Fourth coat—Ground, color of car.
Fifth coat—Color varnish.
Sixth and seventh coats—Finishing varnish.
No rubbing varnish is used, except in the color varnish.

Inside, the oak is finished dark with one coat of rubbing and two coats of inside finishing varnish. The mahogany and cherry are not stained, and are finished the same. The window sash and all exposed parts where no paint is used are soaked in hot oil before varnishing, and this is wearing as well as the painted work. Several different makes of primers and fillers have been used to hasten the painting, but all but one have failed to wear, and that one takes as long as the lead, and therefore no time is saved, but as the makers claim a longer life than lead, it may pay to use it. In connection with painting, I will mention that all matched work and tenons are filled with white lead before jointing. All the underframe work is painted with red lead and oil before any of the framing is put on.

No figures have been used in this paper, as it is intended to be a description of the work only as done at the shop of the Tri-City Railway Company.

RURAL RAILWAYS*

BY F. McDONALD,
Assistant to the President, Waterloo, Cedar Falls & Northern Railway Co.

By "rural railways" I do not mean interurban railways between two or more cities whose population is sufficient to support a railway for the passenger business alone, or where the population outside the city proper is made up of wage-earners whose employment depends, to a great extent, on the city. The railways to which I refer are the ones that have a fairly large city for a terminal, and for the balance must depend on towns of from 200 to 1500 population and the farmers living adjacent to the line for passenger and freight business enough to keep at least one jump ahead of the sheriff. It is for such railways that I have applied, for want of a better name, that of "rural railways," and it is to this class that the majority of so-called interurban railways in Iowa must belong for some time to come, at least until we have greatly increased our population in both the cities and the rural districts.

In looking over the proposed interurban lines for Iowa, I find that nearly all the promoters are depending on the freight business from the country districts to furnish a large part of the revenue. We have at Waterloo about 45 miles of this class of railway, the balance of our line (about 35 miles) being in the cities of Waterloo and Cedar Falls and between the two cities. We handle freight in carloads on all parts of our line, and have portions which are operated exclusively by electricity, other parts operated entirely by steam locomotives, and some on which both steam and electric motive power are used.

I have been connected with this road (the Waterloo, Cedar Falls & Northern) for the past nine years, during which time we converted the Waterloo Street Railway from a horse car line into an electric street railway, and built the interurban line between the cities of Waterloo and Cedar Falls. The contents of this paper will necessarily be largely a history of that line. The statements made herein will probably conflict with opinions of many of those present to-day, and are simply opinions which have been formed from actual experience during the five years in which we have been engaged in the construction and operation of the "rural" end of our line. In the first place, I wish to say that, so far as I know, we were the first to attempt to build such a line, at least we were unable at that time to find another road operating under the same conditions. Our president, Mr. Cass, and myself made several trips to different points where electric railways were said to be doing a freight and passenger business, only to find that their freight business consisted of a package or express business. In only one instance did we find a road handling freight in carloads in standard steam railway cars on joint through tariffs with trunk line railways. This was the Mason City & Clear Lake Railway, and it had "Clear Lake," a summer resort, which drew large crowds of people during a greater part of the year, to help them out on the passenger end of the business. We had nothing of this sort in the territory which we expected to enter, just the market towns populated by business men, retired farmers and a few laborers and mechanics and the farmers living along the line, each of whom had a stable full of horses. We did, however, have a fairly large territory not tapped by any other railway in one of the richest and best parts of Iowa, also one or two inland towns which only lacked railway facilities to make them flourishing market points for the adjacent farming community. In addition to these we had a number of creameries, whose coal and butter had to be hauled by team from 5 miles to 12 miles. For a start we built 15 miles from Waterloo to Denver, a small inland town of perhaps 150 people.

LOCATION

In locating a line of this kind it is necessary that a territory

* Paper read at meeting of the Iowa Street and Interurban Railway Association, at Dubuque, April 20-21.

be selected in which the competition will not be direct with steam railways already established, the idea being to work in connection with the steam roads as a feeder and not against them, for the farming community alone will never support a railway unless there is a reasonable chance to secure the freight and passenger business in and out of their market towns.

FINANCING

In financing a road of this class one of the great difficulties is to convince the investor of the amount of business which can safely be counted on, and the universal question comes up, "What is the population per mile?" Those who are acquainted with Iowa know that the population per mile of an Iowa farming district, where every farmer owns a quarter section and some of them two or three times that amount of land, doesn't make a very good showing in a broker's office. The only way to convince the financier is to get him on the ground and show him the territory and the need of railway facilities. You can do more to convince your man in one day's drive through Iowa during June or July than you can in a week in his office with a pencil and paper.

You must also be able to show that after you get your freight you have a way to get rid of it by connection with one or more trunk lines—the more the better—on a traffic arrangement whereby your shippers can secure the same rates for an equal distance that the shippers and merchants in neighboring towns, who are located on trunk lines, can get. This, in some cases, is very difficult from the fact that since the time that electric roads entered the field of modern transportation they have been opposed by trunk line officials. Fortunately, some steam railroad officials are broad-minded enough to take the position that they do not care how the business comes to them—by electricity, by team or on foot—so long as they get it.

CONSTRUCTION

In constructing such a line there is a tendency to lessen the original cost by not getting the maximum grades low enough, the idea being that with light trains a 3 per cent or 4 per cent grade can be surmounted without much difficulty, and the cost of construction is lessened materially. Don't do it; for if you do, every time you pull a train over that grade you will regret it, and in time you will be compelled to cut it down, which will cost two or three times as much after the road is in operation. On the Waterloo line our maximum grade is 1 per cent, to obtain which we had to make some deep cuts and some very heavy fills. In locating a line of this kind we have found it of great advantage to follow the half-section lines wherever it is possible, in preference to running on or near the section line or public highway, for several reasons, among which are that it is much easier to secure right of way where in the majority of cases you only take a strip of land off one side of a man's farm, and where you avoid the farm yards and buildings, which, as a rule, are located near the section lines. There is also a decided advantage in securing passenger business through the country from the fact that you have two main roads to draw from, only ½ mile from your line, where in case you are near the section line, you would have but that one, the other being a mile distant in either direction.

Right of way should not be less than 100 ft. in width, in order to get room for borrow pits for obtaining material for heavy fills and avoid long overhauls, also to get width for cuts and a chance to build snow fences far enough from the track to give proper protection. We made the mistake of building our first 15 miles on a 50-ft. right of way, and have never ceased to regret it, for we soon found that it was much easier to get land for right of way before a line is built than to secure additional ground after a line is in operation, and during the past winter this 15 miles on narrow right of way has given us more trouble with snow than the other 30 miles on the same division. In track and bridge construction we followed, as near as possible, standard steam railway construction, and in cases of washouts, wrecks, etc., on the large lines, we have often been called on to detour their trains over our line, and, notwithstanding the fact that these trains are hauled by the heaviest of locomotives, we have never had any trouble or any damage. The bridges I consider the important point, because a comparatively light rail (ours are, for the most part, 60-lb.) will carry a very heavy train if run at a reasonably slow speed. We limit the heavy engines of the steam roads to 30 miles per hour when running over our line, and always send a pilot who is perfectly familiar with all parts of the road.

MOTIVE POWER

This is one of the hardest questions to decide for a road of this class, and while I realize that this is a convention of electric railway men, I wish to say to any gentleman here who is contemplating the building of a railway through a farming district, consider well your location, prospective volume of business and the frequency of the train service which you wish to give before installing expensive electrical machinery and overhead equipment to operate a line of this kind. I think, in discussing this question, we may leave out entirely the question of draw-bar pull and speed, as we all concede that the manufacturers of electric motors have demonstrated, beyond a question, their ability to supply all the speed or draw-bar pull required by the most modern trunk lines of to-day. The question then comes down to one of economy and practicability of operation. On the line out of Waterloo, we have 18 miles equipped with electricity, from Waterloo to Denver Junction, at which point we connect with the Omaha Division of the Chicago Great Western Railway. We use for this line 20,000 volts a. c. stepped down through transformers, and the rotary converters to 550 volts d. c. To avoid running two generators at our power house, Mr. Dryer, who was then with the Westinghouse Electric & Manufacturing Company, suggested that we install a rotary converter, running it as a generator, taking d. c. off one end to supply our city lines, and a. c. off the other end for the longer lines. This was done by removing the starting motor from the end of the armature shaft and substituting a pulley so that it might be driven by an engine. The plan has worked successfully for the four years we have had it in operation. I do not know of any other place where this scheme is in use, and I mention it thinking it might be of service to some of you. I do not know much about lighting plants, but it seems to me that where the street railway and lighting plants are consolidated, it might successfully be adopted, using the a. c. end of the generator for lighting and the d. c. end for the street railway. It is a great saving in power house floor space over putting in two generators and a line shaft or separate engine for each generator.

For the first six months we operated our line to Denver by steam, both freight and passenger trains. Then, having completed the installing of electric machinery and overhead work, we operated it entirely by electricity. This we continued to do for about eight months, using in the freight service an electric locomotive of 120 hp. This locomotive would handle five loads over our heaviest grades, but we found, in operating a freight line, as many of you have found in the passenger business, that we could not take part and let the rest wait until we went back after it. It all must go about the same time. Our business is mainly a through business, and depends on connections with the trunk lines at junction points. For example, stock, butter and other time freight must connect with the time freight trains on the connecting lines, and shippers object to loading any earlier in the day than just time to make the run. As a rule, also, there are one or two days in the week when all stock men wish to ship in order to reach the market on certain days. We soon found that in order to take care of the busiress it would be necessary to put into service a much larger locomotive, which meant increasing the capacity of our power station and overhead lines, the added investment to be used only one or at most two days in the week. We studied the matter carefully, making the comparison of operating electric and steam locomotives, both for labor and fuel, and returned to the use of the steam locomotive for the freight business, except for switching at points where the use of a steam locomotive was not practical.

The amount of coal burned on our steam locomotives averages about 1.4 tons per 10,000-ton miles, while for electrical service it is between 8 tons and 9 tons per 10,000-ton miles. It is true that this is hardly a fair comparison, as the coal used in locomotives is Illinois lump, while that used at the power house is the cheapest Iowa steam, and also for the reason that the steam locomotives have longer runs without stopping, thereby giving them the advantage of the momentum, while the electric cars are operated largely on city lines, where they have to start and stop every few hundred feet. About two years ago we acquired control of 28 miles of steam railway track between Denver Junction and Sumner. We have never equipped this line for electricity, but have operated entirely by steam, running two passenger and one freight train each way per day. The passenger trains are operated the same as the electrical service, stopping to receive and discharge passengers at all highway crossings. We do not find it any more difficult to do this with a light train, consisting of one combination baggage and smoker and one straight day coach, equipped with air brakes, than with an electrical train of the same size. This number of trains takes care of all the regular passenger business without difficulty, and for special occasions we run excursion trains of whatever size is necessary to care for the business. The freight trains make the round trip from Sumner to Waterloo each day, a distance of 45 miles, or 90 miles for the round trip, with one engine and crew.

For passenger business on the rural railway, I have found the advantage of electric motive power over steam is largely a matter of convenience to the public, there being no question but that it is pleasanter to ride in an electric train with no smoke and no odor. On the other hand, the steam train has the advantage of each train having its own motive power. On the electric line, if anything happens to your power house or overhead lines, every train on that section of the road is at a standstill until the damage is repaired, and if it is line trouble and far out, considerable time is lost in reaching the location of trouble, especially if you have no steam locomotive or other independent means of reaching the scene of trouble. In snow, I think with locomotives of the same weight and with the power behind them, the electric will do as good work as the steam, but when it comes to lightning and sleet, the steam locomotives have a decided advantage, and on one of these cross-country lines, over Iowa prairies, the bad sleet storms are as much to be dreaded, on an electric line, as the snow storm. If anyone here has discovered a successful way to fight sleet on an interurban trolley wire, I should like to know it.

Our morning train out of Waterloo must make connection at Denver Junction with the Chicago Great Western train for Fort Dodge, Omaha, and all point West to the coast. In winter, when we were troubled with the snow, we could count on the other road being delayed by the storm to about the same extent we were, but during the early part of March we had a few sleet storms, which, while not as bad as I have seen, were sufficient to delay our electric train for an hour or more, while the steam train never knew there was a storm, so far as its running time was concerned. No sooner does the weather become warm enough to do away with the trouble of snow and sleet than the trouble of lightning begins. We are protected by tank arresters, pole arresters and car arresters, but still we lose more or less armatures, to say nothing of the loss of controllers, light circuits, etc. We have, fortunately, never lost any generators at our power station.

For switching purposes it is often possible to use an electric locomotive in places where it would be impossible to use steam. For example, on our line at Cedar Falls we switch all the coal for the Iowa State Normal School from the steam railways, a distance of about a mile. We do this over our regular city line on the streets of Cedar Falls. During the fall and winter months they use about 300 tons per week, and it would be impossible to perform this service with a steam locomotive, on account of the objection of the city to running it on the streets. As it is, some property owners claim that the value of their property is decreased because a car or two of coal is hauled past their residence each day in a coal car instead of in wagons, which would have to be done if we did not switch it.

RATES

In making rates, both freight and passenger, we have adopted the regular steam railway practice along our rural line, viz., Iowa distance tariff and classification for freight and 3 cents per mile for passengers. I speak now of local business. On interstate and all through business we have through tariffs with our connecting lines and their connections of which we draw our proportion, according to our traffic agreements with them.

Some people seem to think the electric or small steam railway should be able to handle passengers or freight for about 50 per cent of what the trunk lines charge. I cannot see it in that way, nor do I see any reason for anyone supposing that it can be done, and I wish to say that a company will find it much harder to raise the rate, if it is too low at the start, than to drop it if it is found too high. We have had some experience along that line. The patrons of a rural railway are not of a class that turn out en masse every day or do a great amount of pleasure riding, and for all special occasions where there is a chance to draw large crowds by reduction of rate, you can put in an excursion rate that will in no way interfere with the regular business. We are members of the American Railway Association and the Western Passenger Association, and conform to their rules, selling interchangeable mileage, etc. We have a general passenger department and a general freight department, each of which looks after the business of its own department. In establishing freight terminals in Waterloo, we found we could lease terminal rights from the railways already established near the business center of the city much cheaper than we could secure and maintain our own in anywhere near as good a location. We do, however, maintain a city ticket office in connection with our city line waiting room, where we sell tickets to all parts of the world, and often only haul the passengers from his or her home to the depot on our city cars. Did space permit, I would like to touch on many points in connection with the operation of the rural railway, such as the system of despatching trains, handling of business at the smaller towns, making of schedules, etc., all of which are very necessary to economic and successful operation of the rural railway, but I have already overstepped the time limit and am running on the time of other members on this morning's programme.

The success which has attended the placing of limited cars on the Appleyard lines between Dayton and Columbus, Ohio, has led the officials of the Dayton, Springfield & Urbana Railway to try another project by placing fast service cars on the line between Urbana and Dayton. To this end, General Manager Stebbins is now at work on a schedule which will shorten the time between the two cities about forty minutes and to make the regular service between Urbana and Dayton exactly one hour.

IOWA CONVENTION NOTES

The W. R. Garton Company, of Chicago, occupied a parlor off the lobby, in which were shown nearly all the numerous railway specialties which this company manufactures and is agent for. President W. R. Garton was in attendance during the entire convention and was assisted by E. D. Hill.

Porter & Berg, manufacturers' agents, Chicago, made a large exhibit in the south gallery off the main lobby. This exhibit included nearly all the lines of electric railway appliances for which Porter & Berg are agents. The Crouse-Hinds arc headlight, which overcomes the difficulty experienced from shadows due to the wandering of the arc, occupied a prominent place. E. R. Mason was in attendance.

The National Electric Company was very much in evidence, being represented by George Voigt, of the Chicago office; A. P. Peck, H. M. Klingenfeld and J. Frank Perry. The company occupied a parlor where samples of some of its electrical apparatus were shown and a large number of handsome photographs of recent electrical installations, as well as bulletins giving information about both the electrical and air-brake apparatus of the company. The National Electric Company entertained the convention by an orchestra concert at the hotel Thursday evening.

The Johns-Manville Company made an exhibit of the Sach's "Noark" fuses, in charge of Frank E. Johnson.

Other companies making electric railway apparatus and supplies having representatives at the convention were as follows:

General Electric Company—F. W. Taylor, W. H. Coleman, G. A. Seabring.

Westinghouse Electric & Manufacturing Company—H. A. Coughlin, A. M. Miller, W. R. Pinckard and Clarence A. Ross.

Westinghouse Traction & Brake Company—C. J. Olmstead.

Sterling-Meaker Company—F. D. Willis.

National Lead Company—J B. Mendenhall.

Viscosity Oil Company—E. R. Stubbs.

Raymond Lead Company—J. B. Hermann.

A. Sorge, Jr., & Company—E. Emory.

Allis-Chalmers Company—F. G. Whipple.

Electric Storage Battery Company—John A. White.

Fairbanks, Morse & Company—H. H. Clark.

Taylor Electric Company—C. H. Dodge.

Gould Storage Battery Company—P. B. Yates.

National Carbon Company—C. W. Wilkins.

CONSOLIDATION OF RAILWAY COMPANIES AT YORK, PA.—IMPROVEMENTS PLANNED

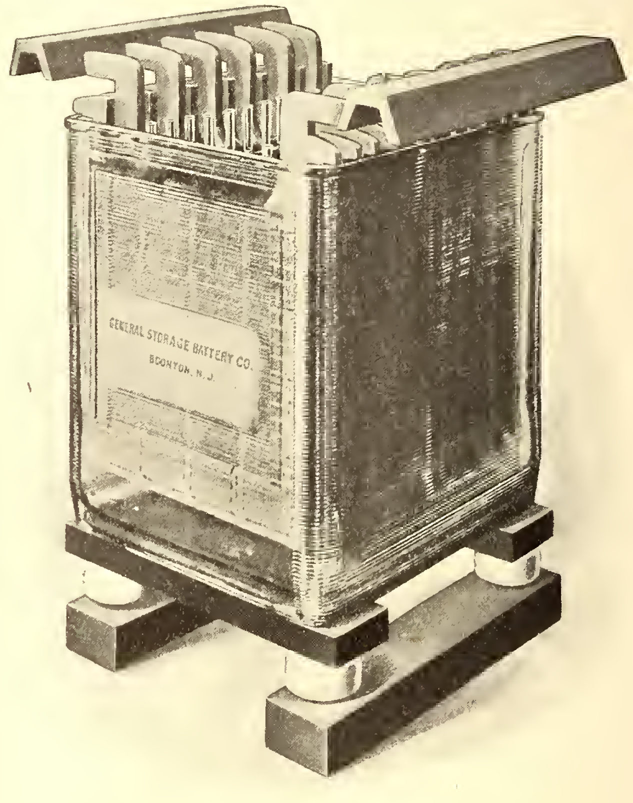
Plans have just been completed for the reorganization and expansion of the York Street Railway and the York Traction Company, of York, Pa. The project will involve an investment in excess of $5,000,000. The plans have been under consideration for the past year, but were not matured until a few days ago. All the rural lines and city lines will be incorporated under one head, and a capital sufficient to permit a completion of all the proposed extensions of the rural lines at an early date. Many of these lines have been surveyed, but are uncompleted. To do this, it will cost approximately $3,000,000. The present electric system represents an investment of something over $2,200,000, of which sum $1,500,000 is represented in bonds, and $700,000 has been invested by the local people. When the new corporation has been formed and the lines completed there will be more than 100 miles of road.

The Cincinnati, Dayton & Toledo has installed a regular half-hour service between Dayton and Cincinnati.

NEW STORAGE BATTERY

A new type of lead storage battery has recently been placed on the market by the General Storage Battery Company, of New York, as the result of several years' study and work on the part of Joseph Bijur and his associates. The feature of the battery is the form of plate used, which, while retaining the well-tried electrochemical combination of lead and sulphuric acid, differs radically in design, construction and results from forms hitherto known in the storage battery art.

With the collaboration of Dr. J. S. C. Wells, of Columbia University, in the earlier stages of the work, Mr. Bijur set out to produce a storage battery plate according to an ideal design which should be both mechanically and chemically perfect. Such a design, in their opinion, should combine a rigid structure, freedom from tendency to distortion, perfect acid diffusion, active material incapable of being displaced, high specific capacity, high rates of charge and discharge, high efficiency, good regulation and freedom from "sulphation," buckling, or any other destructive action, save ordinary and unavoidable wear and tear. These characteristics, they believed, could only exist in a form of plate made up of small, finely subdivided structures, each free to expand unrestrainedly, and firmly welded to a strong supporting and conducting grid.



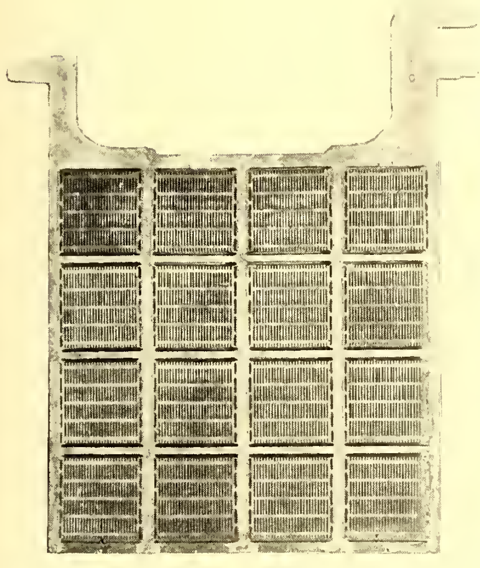
VIEW OF COMPLETE CELL

By no method of metal working then existing was it possible commercially to weld together two elements of which one was a heavy, solid form and the other of very fine, thin parts. It was therefore necessary to devise a new method of metal welding, which, after much patient work, in the face of seemingly insuperable difficulties, was successfully accomplished, and for the carrying out of which, on a commercial scale, an entire line of machinery was constructed on original lines.

The requisite quality and uniformity of oxide next received attention, with the result that, to secure the desired effects, a new process of formation was devised by which great toughness, porosity and other desirable qualities could be imparted to the oxide layer, the whole process being perfectly reliable and at all times under the control of the operator.

The Bijur plates, as illustrated herewith, are composed of multiples of pure lead structures in the shape of gratings or "grills." These are welded to and in one piece with a stiff frame made of lead and antimony only. The weld goes clear through the plates, and is produced without the use of tin, solder flux or any extraneous material whatsoever. The frame merges into the grill without joint. At each end of the grill a space is provided for its elongation by expansion, and provision is also made for expansion sidewise. The result is a plate having the stiffness, strength and inoxidizable support of the alloy grid, rigidly held active parts, yet complete provision for their expansion without the setting up of any strains that could produce buckling.

The grills are composed of a multitude of minute openings, or cells, open through from face to face. When in the untreated metallic state, these grills are very open structures, having a large number of component ribbons running in the vertical direction, supported by heavier cross members running horizontally, which serve as conductors and give lateral stiffness. During the formation process, part of the metallic lead is converted into oxide, which, by reason of the large increase in volume, nearly fills the openings. The ribbons on the positive elements have a large amount of metal left as a reserve for the oxidization which is attendant on the normal action of every storage battery.



ONE OF THE BIJUR PLATES, SHOWING METHOD OF HOLDING GRILLS IN ALLOY FRAME

When the oxide is formed in the rectangular cells, it assumes a slightly elliptical shape, which, expanding into the rectangular containing-space, produces a locking-in that is so positive that nothing short of destruction of the plate can dislodge it. At the same time, even when the oxidization is carried to the point of apparently completely filling the cells, the tendency of the ellipse to grow larger along both its axes insures the presence of a minute slot through the center of the oxide mass, which allows the flow of electrolyte to take place freely through it. The resultant oxidized plate, therefore, is rigid. The grills are firmly held; they expand without producing strains; each particle of oxide is firmly pressed against the lead from which it is grown, and the entire plate is open through and through to circulation and diffusion of the electrolyte. Owing to the character of the design and the structure of the oxide formed, the plates possess several features hitherto unattained in battery practice. "Buckling" cannot take place, and, so far, repeated attempts intentionally to produce distortion have failed. Moreover, since the perfect diffusion through the plate prevents high acid concentration in the pores, deleterious sulphation does not take place even when an effort is made to produce it.

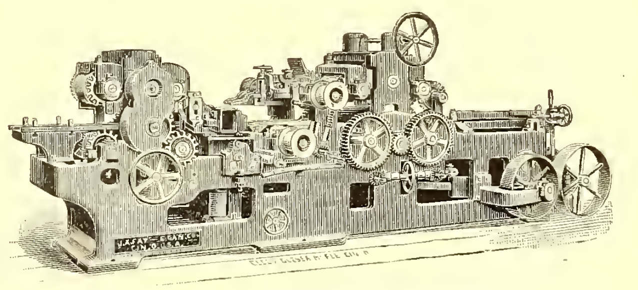
One of the important advantages which the manufacturers claim are gained by this form of design is that in a plate of given dimensions, 20 per cent greater capacity can be obtained with about 10 per cent more reserve lead than in any form of plate hitherto constructed. They also find that, owing to the rapid acid diffusion, full charge may be given the batteries at a voltage of 2.4 volts to 2.5 volts, instead of 2.7 volts per cell as is usually required. This low-charging voltage results in increase of efficiency and reduces the size of boosters required to charge. The structure of the plate forms a conducting network to all parts, insuring equality of action all over its surface, and this, together with the facility for escape of gas without dislodging active material, favors the ability to stand very high rates of charge and overcharge without marked deterioration.

The General Storage Battery Company, which is now putting elements of this type on the market under the name of the Bijur "high duty" battery, has recently equipped a factory at Boonton, N. J., with special automatic machinery for the cheap and rapid production of storage batteries, where, by reason of an abundant and cheap hydraulic power and the automatic machinery used, storage batteries of the highest grade can be produced, it is claimed, for a lower cost per kw-hour capacity than is possible anywhere else in the country.

The company has also developed a new and complete line of automatic regulating boosters, end-cell switches and other auxiliary apparatus for all classes of central station work and power plants, descriptions of which will appear later.

A MODERN FLOORER

Flooring machines have long been a specialty of the J. A. Fay & Egan Company, of Cincinnati, which has always been on the alert to incorporate in later designs such features as its knowledge of machine-tool building and the experience of its customers made desirable. The company's latest effort in this line is the floorer shown in the accompanying illustration. The new machine has all the advantages and conveniences which have made the older ones so useful and universally satisfactory in the past, and over these an array of still newer ones that enable the machine to be one of the finest built, possessing to the fullest possible extent the requisites that make it strictly



STYLE NO. 106 "LIGHTNING" FLOORER

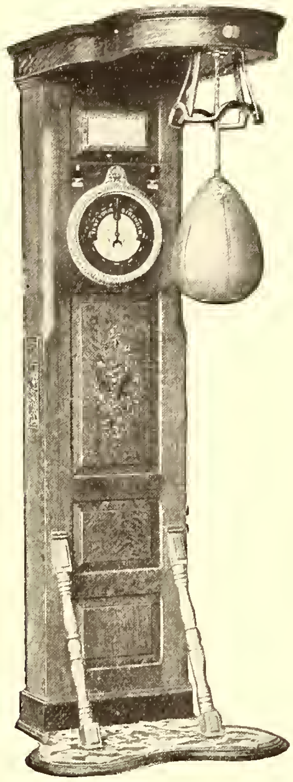
first-class in economy of time, labor and attention in making the various adjustments and efficiency in the high class of work turned out.

Its capacity for turning out much work will be better understood by the word "lightning," which means that the output depends more on the ability of the operators, and is only limited by their quickness. The No. 106 will work the four sides of material 15 ins. wide and 6 ins. thick, matching as narrow as 1½ ins. Every working part of the machine is interchangeable, and all so compactly and strongly built together as to make it very powerful and substantial, and capable of standing up to full pressure without strain or vibration. It will work twisted or warped lumber with facility. The machine is also made with the lower cylinder cutting first, being then called No. 107, or with a third cylinder placed below the upper, and called No. 108. In this last, the upper cylinder is placed between the two lower ones and the stock is worked face down, and is given an extra fine finish at a very high speed. This is an advantage readily appreciated by large makers of hardwood flooring.

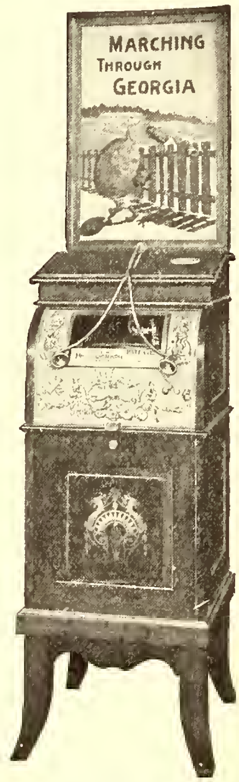
SLOT MACHINES FOR PLEASURE RESORTS

Probably few realize the magnitude of the coin-in-the-slot amusement machine business in this country. When one stops to consider, however, how frequently these machines are seen in public places, it must be evident that they fill a public demand for amusement that is not met in any other way, and must be a source of profit to their owners. This branch of the amusement business cannot fail to be of interest to all managers of electric railway parks and pleasure resorts, because it offers a chance for the company operating the park to realize a good profit on its operation as well as making the park more attractice. In this way these amusement machines are unlike many other park attractions which have to be operated and maintained for the sake of the induced travel.

To those not acquainted with the immense number and variety of coin-in-the-slot amusement machines that are being turned out daily, a visit to the factory of the Mills Novelty



A MODERN BAG-PUNCHING MACHINE



PHONOGRAPH SLOT MACHINE

Company, in Chicago, will be a revelation. This company has as its principal business the manufacture of slot machines of all kinds, but also engages to a limited extent in the operation of amusement arcades or parlors which are seen in the largest cities. It is able to furnish any electric railway company desiring to start an amusement parlor or automatic vaudeville in its pleasure resort, every kind of machine necessary to equip such an establishment. In case the railway company does not wish to make the investment and go into the enterprise itself, as many street railway companies do not themselves operate their park concessions, the Mills Novelty Company is frequently able to bring together companies and parties desiring to rent the privileges of establishing an automatic vaudeville. The company operated the Mills Edisonia on the Pike at the Louisiana Purchase Exposition. With the phonograph and the mutoscope the public is already familiar. There are, however, many other equally popular coin-in-the-slot machines, which are even more popular and satisfactory from the owner's standpoint. It would be out of the question here to mention all of the different machines going into a complete automatic vaudeville establishment, but a few of the latest and most popular can be enumerated.

The bag punching machine in its latest form lowers a regular punching bag into a striking position. When the bag is struck the force with which it goes against the top of the machine is recorded by a spring balance indicating by a pointer. This, of course, is a machine that is very popular with the boys, as the punching bag is too tempting to be resisted.

A very satisfactory substitute for moving pictures is the autostereoscope, showing a succession of photographs which either tell some story or illustrate scenes in distant countries. While these lack the life of the moving picture, they offer a better opportunity for close study. The same principle has been applied to illustrating popular songs, a certain word or verse being brought in view as the song progresses. The Mills automatic piano is one of the highest priced machines the company makes, but is also a certain revenue earner, and one of which the public never tires. An automatic violin, the first of its kind, will soon be ready for the market.

The company builds an immense number of other machines, including fortune tellers, postoffices, souvenir postal card venders, embossing machines, automatic photograph machines, lung testers, weighing machines, lifting machines and grip testers. But a moderate investment is required to equip a first-class arcade.

LARGE CARS FOR THE INTERURBAN RAILWAY COMPANY OF DES MOINES, IA.

The Interurban Railway Company, of Des Moines, Iowa, has placed an order for the construction of eight new cars for use on the Perry and Woodward lines, which will be completed by fall. Two of the cars are to be ready for delivery in July, and will be put in operation at once on the part of the lines completed at that time. The others are to be delivered in the fall. The cars will be by far the largest of the kind ever used in Iowa, and are being constructed according to plans prepared by the officials of the Interurban Company. They will be 50 ft. in length, 8 ft. 7 ins. wide, will have rear and front end vestibules, a smoking compartment, toilet rooms and baggage rooms, and will be equipped with air brakes. The floors will be of steel construction to make them less liable to telescoping in case of wrecks. Hot-water heaters will be used. The finish will be in the same colors as used on the cars now running on the Colfax line. The company is also having constructed at the local shops of the Des Moines City Railway Company an observation car for the use of the officers of the company in making tours over the lines. This car will be arranged for buffet service.

OTTAWA ELECTRIC RAILWAY'S PARK BUSINESS

The Ottawa Electric Railway is arranging to open the summer concerts at Brittannia, Ottawa's summer resort, about 10 miles out of the city, about the middle of May. This year the company will buy a moving-picture machine and arrange to rent a different set of pictures every week; in addition there will be illustrated songs. The company will also put twelve new open cars on this line. The auditorium, which was taken from Victoria Park, will be used for the entertainment; about 700 chairs will be placed in it, and for these a small reserve fee will be charged, possibly 10 cents. The auditorium will afford standing room for several hundred more, and as it is open at the sides, people who cannot get in can see the performance anyway. The experiment last year of giving half-fare rates was so successful that the lower rates will be given again this year, but they will not go into force until the busy season, about the middle of the summer.

FINANCIAL INTELLIGENCE

Wall Street, April 26, 1905.

The Money Market

There were no important changes in the monetary situation this week. The demand for funds was, if anything, more active, but borrowers experienced no difficulty in obtaining all necessary requirements at comparatively low rates. At the beginning of the week there was a sensational advance in the call loan rate to 7 per cent, the highest point attained since December, 1903, due in part to the calling and shifting of loans incidental to the dissolution of the Northern Securities Company, and to the fact that all loans made on Thursday carried over for three days. Subsequently, however, the rate declined rapidly under liberal offerings to 2½ per cent, the closing quotation being 2¾ per cent. The time loan department was moderately active. Early in the week sixty and ninety-day contracts were negotiated on the basis of 3¼ per cent, but later on the market strengthened, and all maturities were held firm at 3½ per cent. The firmness in the time contract department was due to the preparations for making payments on the Japanese 4½ per cent bonds, and for the $25,000,000 New York City 3½ per cent corporate stock. There was also a noticeable decrease in the offerings of funds by foreign banking houses. Commercial paper was quiet and steady. The spring demand being about over, merchants were not required to make much new paper, consequently the supply of prime material was not large. There was, however, a fair supply of middle class paper. Rates ranged from 3¾ to 5 per cent, according to indorsements. The bank statement was decidedly favorable and exceeded the expectations of the "street" in general. Loans increased $7,683,800, due probably to syndicate operation. The increase in cash was $5,162,300, and was considerably larger than was indicated by the preliminary figures of the known movements of periods. Deposits were $12,266,600 larger than in the preceding week, and the reserve required remains $3,066,650. The surplus reserve increased $2,095,650 to $11,448,050, as against $34,203,700 in the corresponding week of last year; $10,985,475 in 1903; $9,461,050 in 1902; $16,759,775 in 1901, and $17,074,275 in 1900. At the close of the week there was nothing in the situation calculated to disturb the prevailing easy condition in the immediate future. The local institutions continue to gain cash in substantial amounts, both from the interior and from the Sub-Treasury, which, together with the receipts from other sources, will, it is expected, be more than sufficient to offset all ordinary demands on the banks. The foreign markets have experienced no decided change from the recent easy conditions. Discounts at the principal European centers were as follows: London, 2 per cent; Paris, 1⅞ per cent; Berlin, 2⅛ per cent; Amsterdam, 2⅜ per cent.

The Stock Market

Trading in the local securities market continued upon a large scale this week, but the dealings were accompanied by severe decline in prices. The principal influences were the further break in the price of Northern Securities stock on the "curb," which, in all, amounted to about 20 points, and the heavy selling of stocks by Western speculators to raise funds to protect the campaign in May wheat. In the early dealings prices continued to show a declining tendency, but during the last hour on Wednesday the market strengthened, and prices throughout the entire list recovered sharply. The improvement, however, was of short duration, for on Thursday there was a further drop in the price of Northern Securities to 155, and the whole market acted in sympathy. Later in the day the declines were accelerated by a sharp drop in the price of May wheat, which heralded the collapse of the Gates campaign. The Stock Exchange was closed on Friday and Saturday, but the wheat market remained open on Saturday, and a further slump took place. The total decline in the price of May wheat was 22 cents per bushel. Confidence was not immediately restored after the three days' holiday. On Monday the market opened lower on heavy selling by the Western element. The decline was accompanied by rumors of open war in the Northern Securities matter, but they were not borne out by subsequent developments. The ruinous wheat speculation carried down with it many small traders, among them the president of a Milwaukee bank, who was forced to admit a defalcation of about $1,400,000. The bank is one of the largest in the West outside of Chicago, and is in nowise endangered in spite of the heavy withdrawal of deposits. The news broke the market on Monday afternoon, when prices touched the lowest levels of the week. On Tuesday there was considerable buying by shorts and prices rose easily. The improvement was continued on Wednesday. During the week London bought about 20,000 shares of various stocks in balance, while the week's sales by the Western element were estimated at about 800,000 shares. A noteworthy feature of the week was the pronounced strength in Atlantic Coast Line and Louisville & Nashville, despite the practical demoralization in other quarters of the market. The closing was strong.

The local traction issues were comparatively quiet, and prices suffered in sympathy with the general market.

Philadelphia

Transactions in the local market for street railway issues were upon a much smaller scale this week, and although prices for all of the leading issues displayed a declining tendency in sympathy with the weakness in the New York market, the net changes for the week were comparatively small. The market exhibited decided strength at the opening, several new high records being established on the present movement. United Gas & Improvment was the early leader of the market, both as regards activity and strength. From 122½, at the close of last week, the price advanced further to 125⅜, the highest point attained this year, but in the subsequent dealings the price declined gradually to 121 at the close, a net loss of 1½ points. Nearly 4000 shares changed hands. Philadelphia Rapid Transit opened unchanged at 36, and on transactions amounting to about 13,000, the price ran off 2 points and closed at 34¼. Philadelphia Company common fluctuated between 47¼ and 46½, closing at the lowest, but the preferred held firm at 49. Union Traction advanced one-half in the early dealings to 61⅜, a new high record, but subsequently it lost all of the improvement, the closing transaction taking place at 60⅞. Other transactions included American Railways at 54, Fairmount Park Transportation at 23 to 21⅞, Indiana Union Traction at 26¼, Philadelphia Traction at 99⅞, Philadelphia Electric at 11¾ down to 11⅜, and back to 11½, United Companies of New Jersey at 270¾ to 270½, United Railways & Investment preferred at 84 to 83, and Consolidated Traction of New Jersey at 84½ to 84 to 84¼.

Chicago

About the only important development in the local traction situation this week was the decree entered by Judge Grosscup declaring the transfer ordinances passed by the City Council in February last unconstitutional, and enjoining the city authorities from enforcing it. The judge also declared that the acts of the State Legislature, passed in 1859, 1861 and 1865, which, taken together, create the ninety-nine-year claims of the Chicago City Railway Company, are in full force and effect. The decree now places this matter within the jurisdiction of the United States Supreme Court.

Trading in the street railway issues was upon an extremely small scale this week, the dealings for the most part being confined to small lots. The weakness in Chicago Union Traction continued, the price sustaining a further decline of 1½ points, 210 shares selling at 7¾ and 7. North Chicago was unchanged, an odd lot selling at 70. Metropolitan Elevated sold at 21½.

Other Traction Securities

The Baltimore market was fairly active, but prices for all the active issues declined sharply. United Railway incomes was the most active issue as well as the weakest, the price declining from 60 at the opening to 55½ with a late rally to 56. About $300,000 of the bonds were traded in. The weakness in the issue was attributed to selling by tired holders and the failure of interests identified with the protective committee to lend support. The 4 per cent bonds were considerably less active and comparatively steady, about $30,000 changing hands at prices ranging from 92⅜ to 91¾. The stock sold at 13 to 13¼ for a few hundred shares. Other transactions included $25,000 Norfolk Railway & Light 5s at 94⅜ to 95, $12,000 Lexington Street Railway 5s at 105, Baltimore Traction 5s at 118½, North Baltimore Traction 5s at 121¼, Virginia Railway & Development 5s at 99, Macon Railway & Light 5s at 99½, Norfolk Street Railway 5s at 112¾, Baltimore Passenger 5s at 108¼, Central Passenger 5s at 119 to 118¾, and City & Suburban 5s at 114½. The Boston market was heavy. Boston Elevated declined a point from 157 to 156 on the exchange of about 600 shares. Boston & Worcester common ran off from 34½ to 33 in dealings of less than 1000 shares, while the preferred declined from 81½ to 80½. Massachusetts Electric common sold at 21 to 20½, and the preferred from 68 to 67. West End common sold as high as 98 early in the week, but later ran off to 97¼, and closed at 97¾. The preferred sold at prices ranging from 117 to 116. On the New York "curb" Interborough Rapid Transit displayed pronounced weakness in sympathy with the general market, the price declining from 207 to 203 on transactions amounting to about 3500 shares. New Orleans Railway common held about steady, 1000 shares selling at 28, but the preferred lost one-half point, several hundred shares changing hands at 77 to 76½. The 4½ per cent bonds sold at 91½ for $10,000.

A fluctuating market was the feature of the few days of trading last week at Cincinnati. At first the advance was fair, with the volume of sale only moderate. Then came increased activity. On Tuesday there were recorded several small transactions. Cincinnati Street advanced to 148½, at which figure a few sales were made. One quite large transaction was, however, recorded at 148¾. Cincinnati, Newport & Covington Light & Traction common sold at 32, a slight advance. The preferred of this company also sold freely at 92¼ and 92½. On Wednesday the market was quiet. Cincinnati Street was steady at 148¾. There were several small sales at this figure. Columbus Railway 4s, to the extent of 10,000, were sold at 92½, and $40,000 Cincinnati, Dayton & Toledo Traction 5s went at 92½ and 93. There was a fair inquiry for securities on Monday, and advanced bids were made for some properties, but the volume of business was only moderate. While the market was firm in general, there were a few weak spots. Cincinnati Street sold at 148½, closing at this price bid and 149 asked. Cincinnati Gas & Electric sold in several small lots at 107½, and at the close it was held at 107¾, with 107¼ bid. Cincinnati, Newport & Covington Light & Traction preferred sold at 92⅛ to 92½, closing with 92 bid. Transactions in bonds were few and of small amounts.

Cleveland Electric declined 4 points as the result of the decision favoring the 3-cent fare company, dropping from 80 to 76. Tuesday of this week there was a recovery of composure and a few lots sold at 77½, and later quotations rose to 78½. It is not generally believed that the company will accept the leasing plan proposed by Mayor Johnson, of which extended mention is made elsewhere in this issue. Aurora, Elgin & Chicago was quite active, with sales at 15 to 15½. Northern Ohio Traction & Light declined to 21¾. Cleveland & Southwestern sold at 9½, an advance of 2 points from last sale.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	April 19	April 26
American Railways	54	53½
Boston Elevated	156	156
Brooklyn Rapid Transit	68½	66¾
Chicago City	199	199
Chicago Union Traction (common)	6⅝	7¼
Chicago Union Traction (preferred)	35	35
Cleveland Electric	81	—
Consolidated Traction of New Jersey	84	83½
Consolidated Traction of New Jersey 5s	110	110
Detroit United	85¾	84½
Interborough Rapid Transit	205	204
International Traction of Buffalo	29	29
International Traction of Buffalo (preferred)	68½	68
International Traction of Buffalo 4s	85	85
Manhattan Railway	166½	164½
Massachusetts Electric Cos. (common)	20½	19¾
Massachusetts Electric Cos. (preferred)	a68	67½
Metropolitan Elevated, Chicago (common)	22½	21
Metropolitan Elevated, Chicago (preferred)	61	61
Metropolitan Street	121⅞	119
Metropolitan Securities	85⅞	82¾
New Orleans Railways (common), W. I	27½	28¼
New Orleans Railways (preferred), W. I	76¼	76½
New Orleans Railways, 4½s	91	—
North American	105¾	102⅝
North Jersey Street Railway	25	25
Philadelphia Company (common)	46⅞	46⅜
Philadelphia Rapid Transit	35⅜	33⅞
Philadelphia Traction	99¾	99¾
Public Service Corporation 5 per cent notes	97½	97½
Public Service Corporation certificates	71¼	71¼
South Side Elevated (Chicago)	93½	93½
Third Avenue	129	128½
Twin City, Minneapolis (common)	117¼	114¼
Union Traction (Philadelphia)	61	60¾
West End (common)	97¼	97½
West End (preferred)	116	116

a Asked. W. I., when issued.

Iron and Steel

"The Iron Age" says, while the tonnage of orders on the books of the United States Steel Corporation, 5,600,000 tons, greatly exceeds the record, it must be taken into account that the capacity is greater through the acquisition of the Union and Clairton. The plants are running to their utmost now. Practically all of the constituent companies are operating to 95 per cent of their capacity and upward, and this is typical of nearly all of the great outside works. So far as the United States Steel Corporation is concerned the continuance of this condition of affairs for four months is assured. A number of reports representing the pig iron market as weakening are afloat, but specific instances cannot be traced. The structural and bridge shops are getting a rush of new work. The cast-iron pipe industry is being pushed to capacity. The only advance announced during the week is that of the National Tube Company, making merchant pipe $1 per ton higher and boiler tube $4 per ton higher.

EVERETT-MOORE ADJUSTMENT

Final adjustment has been made of the affairs of the Everett-Moore syndicate, which became involved in financial difficulties about three years ago through the promotion of street railway and telephone systems in the West. The trustees of the syndicate, Col. F. S. Dickson, Calvary Morris and H. R. Newcomb, were discharged at Cleveland on Wednesday, April 19, the legal tangles of the syndicate having been straightened out so the protection of the bankers' committee and the assistance of the trustees are no longer needed. At the time of the embarrassment the individual members of the syndicate turned over to the bankers' committee all their assets, leaving the handling of the immense interests largely to the judgment of the bankers. This continued for eighteen months, at which time the trustees were selected, and they in turn took up the work that had been carried out by the bankers' committee. The individual members of the syndicate gave a great deal of their time to helping the bankers' committee and later the trustees in their work, and have contributed valuable efforts to the completion of the great task now happily at an end. The vast interests have been handled in such a manner that the obligations have been scaled down from $17,000,000 to less than $4,000,000. More than half of the remaining amounts are owing to corporations which the individuals control entirely.

NEW JERSEY & PENNSYLVANIA COMPANY'S IMPROVEMENTS

The New Jersey & Pennsylvania Traction Company is planning extensive improvements upon its Trenton, Lawrenceville & Princeton road. It has just received two large open cars from the Brill works. They are of the Narragansett type, and will be used principally for Saturday and Sunday traffic, which, it is expected, will be largely increased through their introduction. The cars will be mounted on Brill's 27 E-1 or E-1½ trucks, with 6-ft. wheel base, with 4 GE 57 motors, K-14 controllers and Christensen air brakes. They will be geared for 45 miles per hour, and will make the 13 miles from the center of Trenton to the center of Princeton, two miles of which is through streets, in about 35 minutes. The present schedule for the closed cars is 35 minutes. During the summer the road will be rock ballasted, this being considered much superior to the quality of gravel ballast which was originally put under the ties.

The specially equipped freight car, although in use but a short time, is already bringing much additional business to the road. Carload freight is handled in considerable quantity. It is hauled direct from the Reading Railway tracks in that company's cars, thus avoiding the delay incident to a transfer of the goods to the regular freight car, and eliminating the liability to accident from such second handling.

The line will soon be fed from the new power house in Yardley, Pa., instead of by the power house at Ingham Street, Trenton. Direct current is now used. It is supplied to the line from the southern end, giving a total length of nearly 12 miles to be served. Under the new system alternating current will be supplied from Yardley to a sub-station near the center of the Princeton line. The company now has one 1,000,000 and one 500,000 circ. mil feed cable, and 0000 trolley wire, giving a feed service unequalled in the State, load considered, there seldom being more than two cars (each with 4 GE 57 motors) out on the line at one time.

NEW YORK AND LONG ISLAND COMPANIES ALLIED

It is publicly confirmed that the Interborough Rapid Transit Company, operating the elevated and the subway lines in New York, and the New York & Long Island Railroad, building a tunnel from New York to Long Island City, are controlled by the same interests. Arthur Turnbull, the president of the New York & Long Island Company, is responsible for the announcements that have been made. He gave out a statement on Wednesday, April 19, declaring that the so-called "Goodsell bills," now before the legislature, are to enable the New York & Long Island Company to complete as soon as possible, probably within two years, its proposed tunnel under the East River, connecting the surface railroads in the borough of Queens with the subway at Forty-Second Street. Mr. Turnbull says the company has the right to build the tunnel. It was incorporated for that purpose in 1887. In Dec., 1890, the Board of Aldermen of the city of New York, with the approval of the Mayor, passed an ordinance consenting to the construction of the railroad. Work was commenced but interrupted by a serious accident. It is now desired to abandon a portion of the line west of Forty-Second Street and Madison Avenue, New York, some of which was not embraced in the resolution of the Board of Aldermen giving the company the right to construct its line. There is no advantage to the people of either Manhattan or Queens in the construction of the portions of the line which it is proposed to give up.

Mr. Turnbull also is president of the New York City Interborough Company. This is an ally of the Interborough Rapid Transit Company, and plans to build surface lines in upper New York and the Bronx to supplement the subway and the elevated lines of the Interborough Company. The New York & Queens County Railway, operating the electric railway lines in Long Island City and in Queens County, with which the New York & Long Island Railroad will connect, also is controlled by Interborough interests. Thus the subway and the elevated lines in New York, a system of surface lines planned to traverse the upper part of the city, the tunnel under the East River to Long Island City and the surface lines in that place and throughout Queens County, which is susceptible to rapid development, are all under practically one control.

THAT CLEVELAND SUBWAY

In connection with its plans for subway terminals in the downtown section of the city, the Cleveland Electric Railway is considering the building of a four-track subway out Euclid Avenue to Willson Avenue. Two tracks would be used for express trains, and three or four of the lines taking this general direction would come into the heart of the city over this route. At present the schedule of Euclid Avenue cars from the Public Square to Willson Avenue is about twenty minutes, and it is figured that this could be reduced to four minutes. The scheme would be of great advantage to the interurban lines which enter the city over this route. Engineer Parsons, who has been retained by the company to report on the subway plan, is expected to report in the near future.

NORTH AMERICAN TAKES OVER UNITED RAILWAYS OF ST. LOUIS—JOHN I. BEGGS, PRESIDENT

The transfer of the United Railways Company, of St. Louis, to the North American Company was formerly effected at a meeting held in St. Louis on Thursday, April 20. The board of directors of the St. Louis Company was reorganized by the election of John I. Beggs, James Campbell, Murray Carleton, Robert McCulloch, Judge H. S. Priest, W. V. N. Powelson, Geo. R. Sheldon, William H. Thompson, Festus J. Wade and C. W. Wetmore. A vacancy remains in the board which will be filled later. The directors organized at once by electing John I. Beggs as president, and continuing Vice-President and General Manager Robert McCulloch and the other officers in their old positions.

Mr. Beggs, the new president, says the North American Company will follow the same policy in the management of the United Railways that it has used with the Union Electric Light & Power Company and the Laclede Gaslight Company, of St. Louis. Mr. Beggs will divide his time between St. Louis and Milwaukee, and will devote himself assiduously to studying the needs and requirements of the local St. Louis systems. One of the first things the United Railways will do will be to erect a new woodworking plant, near the main plant, and offices at Vandeventer and Park Avenues. The company has a good machine shop, but the woodworking plant is three or four miles distant, which makes it inconvenient and unnecessarily expensive. A new paint shop will probably be built in the neighborhood of the main shops in the near future, and the next change to be made will be in furnishing of power for the running of cars from the new plant of the Union Electric Company. This will enable the company to shut down at least two of the United Railways' power plants. Mr. Beggs denies emphatically the statement that the company has in contemplation taking over the St. Louis & Suburban Railway.

In connection with this transfer of the property to new interests it seems fitting here to review briefly the capitalization of the United Railways Company, and to present for comparison the earnings for the years 1904, 1903 and 1902. The total capitalization is as follows:

Stock	
Preferred	$12,983,200
Common	24,913,800
Total	$37,897,000
Funded debt	
Underlying liens	$13,688,000
General first 4s	28,292,000
St. Louis Transit Company improvement 5s	10,000,000
Total	$51,980,000

There are no indications of any change in capitalization. However, the company owns $7,000,000 par value of its own preferred stock not shown in table of capitalization, as given, which may be used for the benefit of the company. No more of the improvement 5s or general mortgage 4s can be issued.

The earnings for the fiscal year ended Dec. 31, 1904, and 1903, 1902, follow:

	1904	1903	1902
Gross and other income	$9,977,564	$7,295,847	$6,452,219
Operating expense and tax	5,751,067	4,513,514	3,967,721
Net	$4,226,497	$2,782,333	$2,484,498
Interest on underlying liens and mortgage 4s	1,886,080	1,886,080	1,886,080
Balance	$2,340,417	$896,253	$598,418
Int. on improvement 5s	500,000	500,000	500,000
Surplus	$1,840,417	$396,253	$98,418

In the distribution of net earnings of 1903 and 1904, allowance has been made for the full amount of outstanding funded debt as it exists at present, and which cannot be further increased. In comparing the annual earnings, account should be taken of the abnormal earnings for 1904, due to the exposition.

The years 1903 and 1905 present a fairer comparison, since both are normal. Comparing the first three months of these years, there is an increase of slightly more than 25 per cent for 1905, in spite of the extreme weather. At the same ratio, it is estimated that the gross for 1905 should be $8,390,223. Figures for the first three months of 1903, 1904 and 1905 follow:

Gross earnings for January, February and March, 1905	$1,840,920.00
Gross earnings for January, February and March, 1904	1,773,828.27
Gross earnings for January, February and March, 1903	1,579,263.46

Recently the board of directors of the North American Company was increased from 12 to 18 members, and these gentlemen have been elected as the additional members: Adolphus Busch, Breckenridge Jones and Charles H. Huttig, of St. Louis; Fred Vogel, Jr., of Milwaukee, and F. S. Smithers, of New York City. There is still one vacancy in the board. Messrs. Busch, Jones and Huttig are prominent in financial circles in St. Louis. They were interested in the Union Electric Light & Power Company and the Laclede Gas Light Company, and are now, through the exchange of stock, large stockholders of the North American Company. Mr. Vogel is prominently identified with Milwaukee interests, and Mr. Smithers is the head of the firm of F. S. Smithers & Company. The financing in connection with the purchase of the United Railways by the North American Company was arranged for through the recent issue of $12,700,000 of stock.

With the transfer of the traction companies of St. Louis, the North American Company is in full possession of the public utility concerns of that city, and is in a position there similar to the one it occupies in Milwaukee.

CLEVELAND TRACTION AFFAIRS

Events in the Cleveland franchise fight have followed each other so closely during the past ten days as to be almost kaleidoscopic For a week the warring factions filled the columns of the daily papers with interviews and signed letters, in which some surprising charges were made. Incidentally some interesting points in the history of Mayor Johnson's 3-cent fare campaign were cleared up.

President Horace E. Andrews, of the Cleveland Electric Railway, charged that Charles P. Salen, Mayor Johnson's right-hand man, furnished the money which was alleged to have been deposited by the 3-cent fare company when it secured its franchises, and he claimed the money had been returned to the promoters and was not on deposit, as claimed by the city administration. His claims on this point were not clearly refuted, although the opposing parties made vigorous denials. In reply to a charge Mr. Andrews admitted that his company had backed the mysterious proposition made by Will Christy, a year ago, to build and operate 2-cent fare lines, which proposition served to knock out some of the 3-cent fare company's plans. He also admitted that his company had furnished backing for some of the numerous injunction suits brought by citizens against the low-fare company. He charged that the promoters of the 3-cent fare company had offered to sell out at an unreasonable price after they obtained their first franchises. The series of charges and counter charges grew so tiresome that by mutual agreement the controversy was dropped, and at a public hearing on Monday of this week the warring factions got together and Mayor Johnson submitted an outline of plan for settling the entire franchise dispute. His plan is a novel one. The laws of Ohio do not at present permit of municipal ownership, so that the Mayor could not propose to have the city buy the system, but the plan comes about as near it as possible without actually being municipal ownership. Briefly, it is as follows:

The company to surrender all its present franchises, receiving in return a franchise for twenty-five years, covering all lines on a 5-cent basis. Simultaneously the company to make a lease of its property to a trust or holding company, which is to be organized and capitalized at a nominal sum, the members of the holding company to be selected by the elected representatives of the people and the company. Membership to be limited to from six to ten, and to be only such men as the company and the public shall have entire confidence in. Neither party to have the right to arbitarily select a member to represent it—each member must be agreed to by both parties. The lease given to the trust company to contain a clause whereby the city shall have the right to terminate the trust and buy the property, assuming that proper authority is given by the State. In exchange for the lease the present owners of the property to receive a guaranteed dividend, the amount to be agreed upon in advance. The price at which the city may buy to be named in the lease. The lease to provide that the trust company keep the property in first-class condition and make needed improvements and extensions. Should the trust company default in rental or let the property run down, the stockholders would step over and take possession of and operate the property until the expiration of the franchise, on a 5-cent fare basis.

Mayor Johnson's idea is that the surplus earnings, after the rentals were paid, should go to the reduction of fares or to any other purpose that the public might designate. Extensions and improvements to be paid for by additional issues of stock. In arriving at a basis for rental Mr. Johnson proposed that it should be the amount that it would cost to reproduce the property as a going concern, plus a liberal amount for unexpired franchises, plus a further sum for good will, also a sum as the price of peace; in other words, he thinks it would be worth something to the city to have the franchise question finally settled.

Mr. Andrews inquired if the plan would take into consideration the market value of the property as represented by the value of the stock. The Mayor replied that he thought that the other basis would be a fair and equitable one.

Later Mr. Andrews said that as an individual stockholder he would be willing to try the scheme if a fair valuation of the property could be arrived at.

Prof. Bemis, acting for Mayor Johnson, and one of the engineers of the company will get together data for determining the value of the property. The proposition will be discussed at a meeting of the directors of the company to be held next week.

The City Council on Monday tabled the Felton cross-town street railway ordinance. An ordinance was introduced providing for 5-cent cash fare, eight tickets for a quarter and universal transfers.

A bad blow was administered to the street railway company, Monday, by the decision handed down by Judge R. W. Taylor in the United States Circuit Court, in the injunction suit brought by the company to restrain the city and the Forest City Street Railway Company from taking possession of the Central Avenue route. The court decided that the grant of the old company on Central Avenue expired last March, and that the Forest City Company has the right under its franchise to operate the line in dispute. According to Judge Taylor the franchise held by the Cleveland Electric Railway on Central Avenue expired by limitation March 22, 1905. Since that date the street has belonged to the city, to be disposed of as the laws governing franchise grants dictate. The main point in the decision supports the primary contention of the city and opposes the main argument of the company, that no grant may be extended by implication. The court held that the extension of the franchises on a branch does not extend the franchise of the main line.

The decision was on a motion for a temporary injunction against the 3-cent fare company. Although legally it was upon a preliminary point, yet the holding was in effect final, as the court will not be of a different opinion unless new evidence is produced by the company. The decision was a blow to the perpetual franchise claims of the company. The court did not deny the right of the Council to grant perpetual franchises prior to 1878, but held that a franchise granted for a limited number of years was valid if accepted by the company. The case will undoubtedly be carried to the Supreme Court.

NEW CAR-BUILDING WORKS IN CHICAGO

The Hicks Locomotive & Car Works, manufacturers of steam and gasoline passenger cars, have just purchased twenty acres of ground on Chicago Heights, including the buildings, power, heating and lighting plants being used by L. A. Noyes, manufacturer of steel tubing. The Hicks Company has also arranged with the Chicago Heights Land Association for forty additional acres of land, and will begin at once the erection of a number of other buildings, constituting, is is claimed, one of the most modern and complete car factories in the country. The works will be completed in the fall, when it is said 1000 men will be employed.

LINKING BOSTON, WORCESTER, HARTFORD AND SPRINGFIELD

Arrangements have been perfected by which it is expected that the long projected through electric railway between Hartford and Worcester will be built. Incidentally a new and shorter electric railway route will be completed between Springfield and Worcester. James F. Shaw & Company, of Boston, who built the Boston & Worcester Street Railway and operate that line, have secured control of the Hartford, Manchester & Rockville Tramway Company. This road with trackage rights into the center of Hartford has its northeastern terminus at Rockville, Conn. From there the projected Stafford Springs Street Railway Company has secured rights of way to the Massachusetts State line; from there the Hartford & Worcester, a Massachusetts corporation, has rights to Cherry Valley, a few miles this side of Worcester, from which it has a contract with the Worcester Consolidated Street Railway to take its cars to the center of that city.

The new road when built will run straight from Rockville to the Massachusetts line; thence through the towns of Wales, Brimfield, Sturbridge, Charlton and Leicester to Worcester. From East Brimfield to a point just south of the Palmer line in Monson, rights of way have been secured for a branch road, which would give a much more direct route from Springfield into Worcester by electric railway than has ever been afforded in the past. The main line from Rockville to Cherry Valley is said to require 38 miles of new track. Some 15 miles of this in Massachusetts, and two or three in Connecticut, will be over private land.

By the projected route the distance from Hartford to Worcester would be 60 miles; by the steam railroad passing through Springfield the distance is 85 miles. Fast time can be made over large sections of the electric road, but it is not expected that the trip can be made so fast as by the steam railroad. The cost of the full run will be 85 cents, while the fare on the steam road is now $1.75. The projected line from Springfied to Worcester would be about the same distance as the steam railroad. The running time from Hartford to Worcester would be three hours, making a five-hour trip by electric railway from Hartford to Boston over the tracks of the new road and the Boston & Worcester road. The fare from Hartford to Boston would be $1.30, as against $2.75 by the steam road. The time required to run from Hartford to Worcester by the steam road is about two hours and a quarter, and to Boston three hours and a quarter. The trip from Springfield to Worcester although less definitely figured out, should take about two and one-half hours, with a fare of about 50 cents. If this should be the case, the trip from Springfield to Boston by electric railway would occupy four and one-half hours and cost 90 cents, as against two and one-quarter hours by steam road and a fare of $2.23.

MOVING PLATFORM OPPOSED IN NEW YORK—THE QUESTION OF FOUR TRACKS IN BROOKLYN SUBWAY

Pennsylvania Railroad, New York City Railway and New York, New Haven & Hartford Railroad interests on the one side were arranged against the Interborough Rapid Transit Company and a moving platform company at the hearing before the Rapid Transit Commission, of New York, last Thursday on the proposition to build a moving platform subway through Thirty-Fourth Street, with transfers to the elevated and the subway lines of the Interborough Company. John B. McDonald, of the New York City Company, came forward with a new proposition to add a four-track cross-town subway under Thirty-Fourth Street to the plans of that company. Also Paul D. Cravath, as attorney for the New York City Company, frankly told the commission that that company would be a strong bidder for the Thirty-Fourth Street route, regarding it as an important key to the local subway situation. Samuel Rea, vice-president of the Pennsylvania Railroad, told the commissioners that his company wanted the best possible outlet for the passengers which the Pennsylvania Railroad will land in Manhattan when its station and tunnels are completed. Both Mr. Cassatt and Mr. Rea declared that close subway connections should be made with the new station so that all passengers might be carried promptly to their destinations in the city. Mr. Rea appealed for the construction of a four-track trunk line subway in Thirty-Fourth Street, on the Metropolitan plans, rather than a moving platform subway. He explained that what the Pennsylvania Railroad wanted was a subway which would run from river to river and give transfers to all longitudinal subways, and at the same time have express tracks for express trains to run through the north and south subways on the Metropolitan lines. President Cassatt said he was against an independent line such as the moving platform subway, while Mr. Rea declared that the plans proposed by John B. McDonald would be by far the best suited to the requirements of the Pennsylvania Railroad and of the city. The matter was laid over.

There was a lively session of the Rapid Transit Commission's Plan and Contract Committee Tuesday afternoon, April 25, on the subject of four-tracking the Fulton Street extension of the subway in Brooklyn from Joralemon Street to the junction of Flatbush and Atlantic Avenues. The commissioners were told by the representatives of the Interborough Company, which is building the extension to Brooklyn, that the four-tracking of the line would cost $1,900,000, and they said the company expected the city to pay this cost, and that as additional rental the company would pay the interest on the money in question. Finally, Commissioners Orr and Smith advanced the suggestion of a compromise, by which half of the expense of the additional tracks would be borne by the city and half by the Interborough Company. Mr. Bryan, the representative of the Interborough Company, was not pleased with the outcome. He left the meeting with the understanding that he should communicate with August Belmont to see if he would accept the compromise. Mr. Orr said that if the committee received a favorable reply from Mr. Belmont before the next meeting of the board, that the committee then would report recommending the compromise.

The commission received a new proposition from the promoters of the moving platform, who are seeking a franchise to build a subway across Thirty-Fourth Street from the East River to Ninth Avenue with their own money. Max E. Schmidt, the chief engineer and general manager of the Continuous Transit Securities Company, which controls the platform, laid before the board a supplemental proposition. In it he agreed, if the city would grant the desired franchise, not only to have the subway constructed with the syndicate money, but also to stand the expense of changing the subway from a moving platform affair to a cross-town subway for trains should the moving platform fail to carry the traffic which its backers have guaranteed.

In connection with the stories of community of interest between the New York City Company, the Pennsylvania Railroad and the New York, New Haven & Hartford Railroad comes a statement regarding a terminal station on the east side of the city that is of interest. This station, to be used jointly by the three companies, will be at Thirty-Third Street and Park Avenue, on the New York City Railway's car house property, the block bounded by Thirty-Second and Thirty-Third Streets, Lexington and Park Avenues. The building of this structure is, of course, dependent upon the New York City Company securing franchises to build East Side subways from the Battery to Harlem. The use of the station by the Pennsylvania will be confined to its local traffic.

THE NEW YORK TAX CASES BEFORE THE SUPREME COURT

Arguments in the New York franchise tax cases before the United States Supreme Court were continued Wednesday afternoon, April 19. Ex-Secretary of War Elihu Root concluding his argument, begun the day before. Presenting the street railways cases, he advanced the argument that the franchises under which they operated prior to the enactment of the franchise tax law of 1899 were of such a character that neither State nor city had any more right to increase the tax therein stipulated than the street railroad companies had to decrease it. The legislature, he said, has made franchises taxable as real estate, and they must, therefore, be taxed like all other real estate. "We concede the right of the legislature to tax corporations," he said; "but we demand that they apply to us no more onerous rule than is applied to others in the same class, and we say that there has been gross and conspicuous discrimination in this matter." He did not dispute the power of the legislature to classify for purposes of classification, but he contended that with the classification once made, all in a class must be treated alike, which, he said, is not done under this law.

The last of the cases, that of the Brooklyn City Railroad Company, was then taken up. Charles A. Collin presented this case for the company.

He based his argument almost entirely on the facts connected with the terms on which the original franchise was granted to the Brooklyn City Company. There were originally seven routes in that city on which the right to construct car lines was granted by the City Council on the most favorable bids, and these bids, he he said, fixed the rates of from $10 to $50 in annual fees to be paid to the city, and the fares at from 4 to 5 cents. The contracts, once secured, were turned over to the city company on its giving a bond of $200,000, which is still in effect. "This contract," he said, "fixed the rates of fare and the annual tax to be paid on account of the right created by the contract as specifically as a lease expressing the amount of rent to be paid determines the rental during the period of the lease, and any attempt to increase the annual tax on account of the right created by the contract impairs the obligation of the contract as seriously as an attempt to increase the rental payable under a lease would impair the obligation of the lease."

Messrs. Mayer and Marshall replied, denying the existence of a contract right, and thus closed the argument in the last of the series of cases.

WESTINGHOUSE NEW YORK CHANGES

Westinghouse interests will occupy all but a small part of the nineteenth and twentieth floors of the new Trinity Building at 111 Broadway, New York, after May 1. The executive offices of the Westinghouse Electric & Manufacturing Company, which have for nearly twenty years been at 120 Broadway, will be on the nineteenth floor of the new building, and the Eastern sales offices of the Westinghouse Air Brake Company and the Westinghouse Traction Brake Company will occupy a large part of the twentieth floor. The law offices of Hunt, Hill & Betts, which have been for several years in the Equitable Life Building, will be on the twentieth floor of the new building, and the remaining part of the floor has been sublet to an engineering company.

The United States Electric Light Company, which was absorbed by the Westinghouse Electric Company shortly after the organization of the latter company, opened offices in the Equitable Life Building in 1878, and the old building has been more or less a Westinghouse headquarters in New York for the past generation, and the New York office of George Westinghouse. The new offices in the Trinity Building will be more commodious to provide for the growth of the working staff in the treasury and other departments.

The New York sales offices of the Westinghouse Electric Company will remain in the Hanover Bank Building, at Pine and Nassau Streets, without changes, and the New York office of the Westinghouse Companies' publishing department, formerly at 10 Bridge Street, will be connected with them. The export offices of the Electric Company will continue at the same address, under the management of Maurice Coster, recently appointed to succeed F. B. H. Paine, and the office of Charles S. Powell, the new general agent of the electric company, will be connected with the sales and export offices. As announced in the Street Railway Journal of April 18, Mr. Coster and Mr. Powell have arrived from Paris and from London, respectively, to take up their new duties, after terms of successful Westinghouse service abroad.

The Trinity Building, which is desirably located on the Broadway extension of the subway, with which it will have a direct connection, will, judging from the leases already made, be largely occupied by prominent engineering firms

CAR ORDERS DURING THE FIRST QUARTER OF 1905

The present activity in the electric railway business is evinced in no more significant way than by the large orders for cars which have been placed during the last three months. Many of these orders, and all the more important ones, have been mentioned in the STREET RAILWAY JOURNAL during the past ten weeks. The following table gives those which have been referred to in this paper, together with a few others which are considered worthy of mention, and make an aggregate of over 2000 cars. The list is intended to be in no way complete, and if a record of the orders could be taken from the books of the car-building companies it would undoubtedly swell the total to considerably more than appears below. The reticence of most of the builders in making public such a list prevents a complete record, but enough cars are shown in the table herewith to demonstrate the great activity which now exists in the industry. By Brill any one of the Brill interests is understood.

CITY COMPANIES

City or Company	No. of Cars	Manufacturer
Chicago companies	334	Brill & St. Louis Car Co.
Brooklyn companies	350	Brill, American Car & Foundry Co., Jewett, Cincinnati & Laconia
Astoria	2	Laconia
Westfield, Mass	4	Laconia
Long Island Railway	200	American Car & Foundry
Washington	100	Brill
Baltimore	100	Brill
Philadelphia	100	Brill
Ford, Bacon & Davis roads	125	Brill
Boston	50	Brill
Schenectady	15	Brill
Cleveland	50	Brill
Cincinnati	50	Cincinnati
Providence	50	Cincinnati
Youngstown	20	Niles
Grand Rapids	10	Brill
Stone and Webster roads	75	St. Louis
New Haven	30	Brill
San Francisco	75	St. Louis
Omaha	10	Jones
Rochester	20	Brill
Montgomery, Ala	4	Brill
Manchester, N. H	25	Laconia
Milwaukee Electric Railway & Light	100	St. Louis
Pennsylvania & Mahoning Valley	10	Niles
Chautauqua Traction Company	2	Niles
	1,911	

INTERURBAN COMPANIES

City or Company	No. of Cars	Manufacturer
Syracuse & South Bay	10	Brill
Columbus & Cincinnati Traction Co.	10	Jewett
Scioto Valley Traction Company	6	American Car & Foundry
Ft. Wayne & Springfield	4	Niles
Toledo, Port Clinton & Lakeside	5	Niles
Toledo & Indiana	4	Jewett
Chatauqua Traction Company	8	St. Louis and Niles
Toledo, Bowling Green & Southern	4	Cincinnati
Ft. Wayne & Wabash Valley	4	Cincinnati
Northern Ohio Traction & Light Co.	5	Niles
Queens County Railway	4	Brill
Eastern Transit Company	6	Brill
Sandusky, Norwalk & Mansfield	5	Niles
Illinois Traction System	8	Brill
Ft. Wayne, Van Wert & Lima	2	Cincinnati
Springfield, Troy & Piqua	4	Jewett
Lansing & Suburban	2	Niles
Dayton, Covington & Piqua	1	Barney & Smith
Detroit, Monroe & Toledo	1	Niles
Augusta, Ga	1	Laconia
Lorain Street Railway Company	5	Niles
Steubenville Traction & Light Co.	1	Niles
Jersey Shore & Antas Fort Railway	1	Niles
Green Bay Traction Company	4	Niles
Pennsylvania & Mahoning Valley	10	Niles
	115	

CHICAGO, ROCK ISLAND & PACIFIC AND ELECTRICITY

It is stated that the officials of the Chicago, Rock Island & Pacific Railroad Company are seriously considering the use of electric power on portions of its lines out of Des Moines. The engineers of the company have gone over these lines, and are now engaged in drafting plans and preparing estimates for the work of installing electric power. The plan is to use the trolley system for passenger, baggage and mail and express service and for light freight, and to use steam engines for heavy freight. The lines probably affected will be the 42 miles between Des Moines and Winterset, the 6 miles between Summerset Junction and Indianola, about 18 miles of new road between Knoxville and Indianola, and about 50 miles of road between Des Moines and Oskaloosa. The plan also includes better service between all these points. Where one or two trains are run each way a day, it is the intention to put on a two or three-hour service. The adoption of the plan depends on the cost and its feasibility. The officials believe, however, that some such a plan will be needed in order to secure passenger traffic between the points, as interurban lines will probably be constructed in the near future.

THE TROLLEY IN SUBURBAN PHILADELPHIA

Electric railway projects are booming in the vicinity of Wayne, and at the same time some of the property owners are sizzling with indignation at the very thought of an invasion of this dignified Philadelphia suburb by the electric railway. It is said that the Philadelphia & Western Railroad Company has been running surveys across the town, bisecting, first of all, the Wayne sewage plant, then nipping a number of valuable properties and cutting off a slice of the public school grounds. From the route chosen, it is evident that cost of construction is not to be weighed against a direct and feasible route. It is estimated that the value of the property touched in Wayne alone will reach $1,250,000. George Q. Horwitz, counsel for the Philadelphia & Western Railroad Company, refuses to deny or affirm that it is his company which is making the surveys. The company has, however, spent a great deal of money in purchasing rights of way in West Philadelphia and in Delaware County.

The Pennsylvania Railroad Company, also, is about to take a hand in the fight, and it is announced that this company will lay two additional tracks from Philadelphia to Paoli, 20 miles, giving it six tracks in all. President Cassatt is quoted as saying that the Pennsylvania Company will increase its suburban service—already the finest on its great system—between Philadelphia and Paoli very materially. About 100 trains per day are now operated, and as the only towns in the 20 miles having a population of more than 2000 are Bryn Mawr, Ardmore and Wayne, not one of which has a population of more than 4000, this service is especially noteworthy. Accommodation trains leave Philadelphia for Paoli on the half hour, from 5:45 a. m., until 10:45 p. m., with more frequent service from that hour until 12:40 midnight. Additional express trains are operated frequently morning and evening, with a few during the day. The half-hourly trains make all stops, but are operated strictly on schedule. Eastbound, these trains leave Paoli 25 and 55 minutes after the hour, and arrive in Philadelphia 20 minutes later. Sunday trains also are operated every half hour. This has tended to deter the electric railways from invading the territory. The general opinion, however, has been that the Pennsylvania would reduce its service upon the advent of the electric railway. This, it will be seen, has not proved to be the case. There is no other suburban line running out of Philadelphia which affords such frequent suburban service. The Philadelphia & Reading makes some attempt at it on the Chestnut Hill and Frankford lines, and upon the Glenside line; but so many trains diverging at Jenkintown to New York and Glenside to Willow Grove and Newhope are run over the line that the systematic spacing of trains is not carried out on anything like so complete a scale as the Pennsylvania's Philadelphia-Paoli service.

INTERNATIONAL STEAM PUMP COMPANY APPOINTS GENERAL SALES MANAGER

At a conference last week of the branch office, sales managers and the general officers of the International Steam Pump Company, the announcement was made that F. H. Jones, formerly manager of the air compressor department, would assume the duties of general sales manager and take up the organization of a comprehensive and thoroughly co-ordinated general sales department, similar to those recently organized by several other large corporations. The International Steam Pump Company controls Henry R. Worthington, Inc., having new and extensive works at Harrison, N. J.; the Geo. F. Blake Manufacturing Company and the Knowles Steam Pump Works, located at East Cambridge, Mass.; the Laidlaw-Dunn-Gordon Company, whose manufacturing plant is at Cincinnati, Ohio; the Snow Steam Pump Works and the Holly Manufacturing Company, both located in Buffalo, N. Y.; the Deane Steam Pump Company, of Holyoke, Mass., and the Clayton Air Compressor Works, of Brooklyn, N. Y.

The appointment of Mr. Jones to the general managership of the consolidated sales department follows his successful experience of five years as manager of the air compressor and power pump departments, and in charge of special government work for this company. Mr. Jones is a graduate of Cornell University, class of 1880, and immediately after leaving school entered this branch of work, engaging in the manufacturing, selling, and sales management of pumping apparatus up to the present time.

MOTOR-DRIVING FOR MACHINE TOOLS

At the convention of the National Machine Tool Builders' Association, held in Washington on April 11 and 12, a discussion of the application of individual variable-speed motors for the driving of machine tools was most thoroughly entered into under the following headings: "Advantage of the Motor Drive and Greater Power Necessary in the Belt Drive for Machine Tools," "Relative Cost of Power for Belt-driven and Motor-driven Machine Shops," "Standardization of Motor Drives."

G. Herbert Condict, vice-president of the Electro Dynamic Company, Bayonne, N. J., was invited to address the association on the above subjects, and made the following interesting points:

It was pointed out that in the case of equipping a new shop a saving could be made in the initial cost of the power plant, owing to the fact that there will be less loss in the transmission of the power from the engine shaft to the shaft of the tool, and therefore a smaller power plant would be required. With the belt drive it had been practically demonstrated that the average loss in the shafting and belting amounted to at least 50 per cent of the total power developed by the engine. This is especially owing to the fact that when a belt is laced it is made as tight as possible, in order to provide for stretching, and this results in loss of power in the friction in the bearings as well as in the running of the belt itself. After the belts have run for some time they become loose, and there is a loss of power from slipping. In the case of the line shafting itself, no matter how carefully the line may be put up in the first place, there will shortly be a certain amount of distortion, especially in a long and heavy shaft, which in time will cause a great loss in the shafting bearings even if they are well lubricated.

In electrical transmission, assuming that the shop is to be operated at, say, 75 per cent of the generator capacity, so that a good efficiency can be obtained from the generator itself, the loss between the engine shaft and the line will be about 6 per cent, the line loss 2 per cent, and an average loss in the motor itself of about 17 per cent, a loss between the motor shaft and the shaft of the tool itself, where a single pair of gears or a chain drive is used of 5 per cent, or a total loss between the engine shaft and the tool shaft of about 28 per cent. Attention was called to the fact that the loss in the shafting and belting is practically a constant loss, no matter whether the shop is operated at its full capacity or not, while the loss in the case of the electrical transmission varies practically with the power used. Instances were given of a plant which has been entirely equipped with individual motor drive, in which only one-half of the power capacity had been installed, which had been calculated would be necessary in the case the shop had been designed for belt drive, and that this power plant had been operated on an average of only one-half of its capacity, thus showing that in this particular case only 25 per cent of the power was required for running the shop with electrical transmission that had been estimated on for belt transmission. Another case was given in which it was desired to operate only a few tools in a shop, for which about 25 hp would be required, and a spare engine of about 35-hp capacity was started up to do the work. It was found that this engine would not turn over the shafting, and upon a careful investigation of the entire plant it was discovered that over 50 per cent of the power was consumed in the shafting alone. One of the members of the association had stated that he knew of a case of power transmission which had been carefully tested, and in which it was found that 83 per cent of the power produced had been consumed in shafting and belting. It is therefore assumed that the average loss in belt-driven shops of 50 per cent of the power is not excessive, and that therefore a large saving in the initial cost of the power plant would result if the electrical drive were adopted in place of the belt drive. As to the relative cost of the equipment of totals with individual motors and of their equipment with shafting and belting, it is impossible to arrive at any exact figures, but provided that the two-wire system should be adopted (as in the case of the inter-pole motor) it is believed that the cost of the electrical transmission would be much less than that of the belt and shafting transmission.

As to the difference in cost of maintenance of the motor drive and shaft-belt drive, there is no question that the former will show a greater saving over the latter, as in the case of the electrical drive the cost of maintenance is comparatively small, assuming that the electrical apparatus is made according to the most advanced methods of designs and skill which are in vogue at the present time. This is particularly the case in electrical machines using ball bearings, owing to the fact that a guarantee of ten years can be obtained on these bearings from the manufacturer.

Statement was made by one of the members of the association that he had been unable to secure from any of the electrical manufacturers a variable-speed motor which would operate on a 500-volt circuit. Mr. Condict stated that the inter-pole motor would operate on a 500-volt circuit as well as on a 110-volt circuit with high efficiency and absolutely sparkless, even at a speed ratio of 4 to 1.

Attention was called to the celerity with which speeds of the tool can be changed, and also to the fact that the very much greater variations of speed can be secured, so that the tool can be run at the most advantageous rate for any given work. There is also less opportunity for accident to men and equipment, owing to the fact that there are no belts to throw on and off. In this connection the saving in time was referred to, as in the case of the electrical change it is only necessary to turn a handwheel or lever instead of throwing a belt from one pulley to another. Assuming that the generating plant furnishing the power is built on up-to-date methods, so that a spare unit is available, there is practically no liability of a shut down on account of a hot bearing or breakage in any part of the equipment. Reference was made to a case in which a department of a machine shop was being examined, where the bulk of the tools were driven from a line of shafting, but one lathe was equipped with a variable-speed motor. A hot bearing occurred on the line shaft and shut down all tools run by the shaft, and for 20 minutes twenty-three machines were idle while the machinist on the motor-driven tool continued his work. As these shut downs are liable to occur in the best regulated shop from various defects and troubles of shafting and belts, this item of saving is quite an important one. Attention was called to the fact that in the convention held by the electric power and railway interests no reference is now made to the belt driving of electric generators, as no designer of a modern plant would consider anything but a direct-connected unit. The statement was made that in all probability the equipment of the shop by shafting and belting will not be considered by future conventions of the Machine Tool Builders' Association, as there seems to be a desire on the part of both the machine shop men and the builders of machine tools to equip all tools, no matter of what capacity, with the individual motor drive. Incidentally, reference was made to the absence of dirt and non-interference of the lighting which are features of the motor-driven shop.

PROGRAMME OF THE INTERNATIONAL RAILWAY CONGRESS

The seventh convention of the International Railway Congress, which meets once every five years, will be held at Washington, D. C., May 3-13, 1905. The membership includes steam railway companies in all parts of the world, and the last session was held in Paris in 1900. It is expected that the delegates from abroad will reach New York City by May 1. On that day a programme has been arranged by which they will be enabled to visit the principal points of interest in that city. May 2 will be spent in Philadelphia, and May 3-13 in Washington. After that date the foreign delegates may take either a short tour, comprising Altoona, Pittsburg, Cleveland, Buffalo, Schenectady and Boston, or a longer tour, combining as well Cincinnati, St. Louis, Chicago and Montreal. The subjects to be discussed at Washington include the following:

Section 1—Way and Works.—I. "Wooden Sleepers or Crossties; Selection of Species of Timber Used and Processes of Preservation." II. "Rails for Lines with Fast Trains." III. "Improved Rail Crossings" (frogs). IV. "Concrete and Imbedded Metal."

Section 2—Locomotives and Rolling Stock.—V. "Locomotives of Great Power." VI. "Pooling Locomotives." VII. "Automatic Couplers." VIII. "Electric Traction."

Section 3—Working.—IX. "Lighting, Heating and Ventilation of Trains." X. "Automatic Block System." XI. "Baggage and Express Parcels." XII. "Suburban Traffic."

Section 4—General.—XIII. "Slow Freight Rates." XIV. "Bookkeeping." XV. "Duration and Regulation of Work." XVI. "Provident Institutions."

Section 5—Light Railways.—XVII. "Influence of Light Railways on the Main Lines." XVIII. "Direct Financial Co-operation by Public Authorities." XIX. "Organization of a Cheap Service on Branch Lines which Carry Little Traffic and on Light Railroads." XX. "Traffic Conveyed by Automotor Cars."

TUCKER-ANTHONY TO BUILD BETWEEN INDIANAPOLIS AND TERRE HAUTE

It is announced that the Tucker-Anthony syndicate of Boston has just taken over the franchises and partly completed roadbed of local companies, and will immediately begin the construction of a traction system between Indianapolis and Terre Haute, Ind., a distance of 72 miles. The firm has bought the absolute rights to this property, including 14 miles of completed roadbed between Indianapolis and Danville. This system will be an important extension of the already large holdings of the firm in Indiana. The new road will have its terminal in the large Union Station at Indianapolis.

MR. BEGGS ELECTED PRESIDENT OF THE NATIONAL ELECTRIC COMPANY

A special despatch to the STREET RAILWAY JOURNAL from Milwaukee, dated April 27, states that the First National Bank, of Milwaukee, had had assigned to it about two-thirds of the capital stock of the National Electric Company as security for loans. The bank has now taken over the control of the latter company, and John I. Beggs, Charles F. Pfister, Frederick Vogel, Jr., J. H. Van-Dyke, Jr., all of whom are directors of the First National Bank, have been elected directors of the National Electric Company, replacing S. W. Watkins, president; F. G. Bigelow, chairman of the board of directors; F. C. Randall, director, vice-president and general manager, and Gordon Bigelow. Former directors A. N. McGeoch and B. T. Becker will remain on the board.

John I. Beggs, president of the Milwaukee Electric Railway & Light Company, has been elected and has accepted the presidency of the National Electric Company and will direct its affairs. Mr. Beggs announces that the business of the company will be actively continued and all contracts promptly completed. The indebtedness is now being ascertained, and when it is known, a meeting of the creditors will be called to consider the best plan for protecting all creditors and promoting the future welfare and progress of the company, which Mr. Beggs believes can be made successful and profitable.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED APRIL 18, 1905

787,363. Car Brake; Charles A. Fisher, Niagara Falls, N. Y. App. filed May 14, 1904. Details of construction of an auxiliary brake drum.

787,527. Trolley Retriever; Francis M. Miller, Arcadia, Ind. App. filed Feb. 2, 1905. The trolley cord is wound upon a drum mounted in a casing, in which is also mounted a continuously-driven pinion, and means whereby an upward pull on the cord will throw the drum into engagement with pinion and thereby wind up the cord.

787,574. Safety Appliance for Street Cars; Robert Hirsch, Teplitz-Schonau, Austria-Hungary. App. filed Dec. 28, 1903. Two rollers mounted in advance of the car truck and at right angles to the track rails, are adapted, when an obstruction is encountered, to rotate in a direction opposite to the direction of rotation of the car wheels and at the same time to swing around to a position parallel to the track rails to thereby brush aside any obstruction.

787,603. Car Seat; Hubert Witte, St. Louis, Mo. App. filed April 29, 1904. Details of a "walkover" seat.

787,643. Car Brake; Jacob Roediger, St. Louis, Mo. App. filed July 15, 1904. Relates more particularly to means for uniting the hand-operated brake with the air-brake in order that said brakes may be used independently and yet utilizing but the single set of brake rods that are ordinarily made use of underneath the car body.

787,682. Car Construction; Frederick W. Langehennig, St. Louis, Mo. App. filed Nov. 21, 1904. The combination of side sills, insert tie-plates positioned between said sills and extending upwardly therefrom, and posts secured to said tie-plates.

PERSONAL MENTION

MR. CHARLES DAVIS has been elected auditor of the Olean Electric Railroad, of Olean, N. Y.

MR. J. VAN VLECK, mechanical engineer of the Interborough Rapid Transit Company, of New York, sailed for Europe Thursday, April 27.

MR. H. J. LAKE, master mechanic of the Muncie, Hartford & Ft. Wayne Railway Company since the road was opened, has resigned to accept the position of master mechanic of the Indianapolis, Columbus & Southern Traction Company. Mr. Lake will assume his new duties May 1. His heaquarters will be at Greenwood, Ind.

PRESIDENT EDWARD C. SPRING, of the Ohio Interurban Railway Association, is making a trip through Ohio and Michigan to induce companies, not already members of the association, to join the organization, and particularly to increase the number of roads in the arrangement on interchangeable coupon books. The books are in use on 21 road. and the association is very desirous of making them universal throughout the district.

MR. NEWCOMB CARLTON, fourth vice-president of the Westinghouse Electric & Manufacturing Company, has been elected a member of the executive committee of the American Street Railway Manufacturers' Association to succeed Mr. Calvert Townley, resigned. Mr. Charles C. Pierce, Boston representative of the General Electric Company, has also been elected to the executive committee of the American Street Railway Manufacturers' Association, to succeed Mr. J. R. Lovejoy, resigned.

MR. THOMAS COMMERFORD MARTIN, editor of the "Electrical World and Engineer," of New York, was tendered a complimentary dinner at the Café Royal, London, on April 8, by representative members of the British Institution of Electrical Engineers, as a mark of appreciation of that gentleman's many efforts in the entertainment of British visitors to the United States last year. Mr. Robert Kay Gray, past president of the British Institution of Electrical Engineers, presided at the banquet, at which some forty gentlemen were present.

MR. F. L. MATSON, master mechanic of the Indiana Union Traction Company, at Anderson, Ind., on May 1, leaves that company to become superintendent of motive power for the Chicago & Milwaukee Electric Railroad Company, at Highwood, Ill. Mr. Matson received his early mechanical training in steam railroad shops. He went to the Indiana Union Traction Company in 1901 as assistant master mechanic, and the following year was appointed master mechanic. Previous to that he was with the South Side Elevated Railroad Company, of Chicago.

MR. DAVID YOUNG, expert advisor to Brown Brothers, of New York, in traction matters, is engaged in making a thorough examination of the property of the United Railways & Electric Company, of Baltimore, with a view to making suggestions for the further rehabilitation of the system. Mr. Young, who formerly was general manager of the North Jersey Street Railway Company, now a part of the system of the Public Service Corporation, has advised similarly in regard to the interests of Brown Brothers in St. Louis, San Francisco and other cities.

MR. J. N. DODD, recently with the English Electric Manufacturing Company, Preston, England, arrived in Boston April 17, after a residence of about five years in England. Mr. Dodd's work in this country is best known in connection with the Walker Company, of Cleveland, Ohio, with which he was associated for about three years, designing railway generators and motors. On the absorption of that company by the Westinghouse interests in 1899, Mr. Dodd went to England with Mr. Sidney H. Short, to assist him in the engineering work in connection with the formation of the English Electric Manufacturing Company, and the development for it of a line of American types of railway generators and motors. Since Mr. Short's death, in 1902, Mr. Dodd has carried on his work, having entire charge of the standardization of the Electric Company's direct-current machinery. That work being now completed, he resigned his connection with the English company this spring and returns to this country to take up engineering work here. He will spend a few weeks in reviewing the American railway engineering field before taking up active work. Mr. Dodd is a graduate of Princeton University, class of '93, and previous to his practical experience in electrical designing work was Fellow in Mathematics in Princeton University, and Professor of Mathematics and Physics in Bethany College, West Virginia.

MR. C. D. EMMONS has been appointed general manager of the Fort Wayne & Wabash Valley Traction Company, of Fort Wayne, Ind., in charge of all the company's property in Northern Indiana. The system embraces the following properties: Fort Wayne city traction lines, Fort Wayne electric lighting plant, Fort Wayne & Southwestern Traction Company's line from Fort Wayne to Wabash, Wabash River Traction Company, and Wabash-Logansport Traction Company from Wabash to Logansport, the Logansport Street Railway, and the Logansport, Rochester & Northern Traction Company, and the Lafayette Street Railway Company. The other interurban lines to be built out of Fort Wayne north and south will also be under his management. Mr. Emmons was born in Lafayette, Ind., in 1871. He was taken in his boyhood to Pittsburg, where he lived for eighteen years. He was educated at the Western University of Pennsylvania, graduating with the C. E. degree. He then entered the service of the Pennsylvania Railroad, beginning as a rod man, and advancing to the position of supervisor of signals for the territory around Philadelphia. In 1900 he accepted an offer to become general superintendent of the Lafayette City Railway system. In July, 1903, he came to Fort Wayne as general superintendent of the lines enumerated above, beside acting as superintendent of construction of the Ohio & Indiana Construction Company, which is building the Fort Wayne, Van Wert & Lima Railway, which will be completed into Fort Wayne next summer.

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REMITTANCES.—Remittances should be made by check, New York draft or money order in favor of Street Railway Journal.

CHANGE OF ADDRESS.—The old address should be given as well as the new, and notice should be received a week in advance of the desired change.

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 9300 copies are printed. Total circulation for 1905, to date, 148,850 copies—an average of 8270 copies per week.

The International Railway Congress

The meetings of the International Railway Congress at Washington this week promise to be very largely attended and should be of great value in adding to the general knowledge as to electric operation. At the last meeting of the Congress, held in Paris in 1900, little could be reported on the application of electricity to steam line conditions. There were presented at that meeting, it is true, several papers descriptive of storage-battery motor cars in Europe and of the third-rail experiments being conducted at that time in this country by the New York, New Haven & Hartford Railroad. But little had been accomplished up to that time, and there was not much which could be said either in favor of or against the new motive power, based on actual practice.

At present, matters are different, although the progress during the last five years has not been so rapid as it might have been. In the direct application of electric power to steam railroad work, America has lagged behind Europe, and outside of the uncompleted installation of the New York Central and Pennsylvania Railroad companies, this country has little to show, of any magnitude, bearing directly on this subject. But on our subway, elevated and high-speed interurban railways, we have in service the same principles of construction and character of equipment which will be used in heavier work. It will be impossible, for instance, to see the Long Island Railroad Company's electric cars in operation; but the New York Subway steel cars, which are just like them, can be studied at length in New York City. The multiple-unit system to be employed on the New York Central Railroad is in operation on over half a hundred different electric roads in this country at present, the third rail on twenty-five or thirty roads and steam turbines of large size in equally as large a number of stations. Single-phase motors can also be seen, working on tramway lines it is true, but on 3000 volts, and perfectly applicable, so far as their principle is concerned, to as much heavier work as may be desired.

While America has practically no example, outside of elevated railways, of electrified steam lines, it must not be assumed that no evidence on this subject will be presented at the Congress. At least one of the great steam railway companies of England, which has gone extensively into electricity, will be well represented at Washington, and papers on European progress in this direction will be presented by French, Italian and Belgian engineers, all of whom will speak from actual experience. It is also reported that one of the German Government engineers present will present a report of the Zossen trials. Altogether it is very fortunate that the 1905 Congress should be held in this country, partly so that our foreign visitors can inspect American electrical installations, but still more so that American managers can learn through them the possibilities of heavy electrical traction.

The Relation Between Electric and Steam Roads

Almost from the beginning of electric traction the competitive importance of the new motive power became evident, although the early electric roads were tramways in the ordinary sense of the term. Their ability to make good time and to land their passengers somewhere nearly at their destinations told in their favor, and will of necessity continue so to do. The street railway utilizing the public roads and giving in return for that valuable privilege the advantages of low fares, frequent service and convenient stopping places, occupies a place quite by itself in public transportation. The steam railway, merely because of its location, cannot enter into direct competition with the street railway, pure and simple, although it feels that competition very keenly within a certain district. It is hardly necessary therefore to consider this phase of the matter. In the recent development of electric traction, however, a totally different condition of things has arisen. Suburban and interurban electric roads have outgrown tramway conditions, and the more important of them have become ordinary railroads, specialized in service and using a new motive power, but operating under conditions similar to their older rivals. That this new type of railroad has met a public want its success amply shows, but we think it a mistake to suppose that the difference of motive power implies a necessary attitude of hostility, or that there is anything essentially irreconcilable in the positions of the two types of road. They meet respectively two phases of public demand which actually exist, and so long as they meet them, both will prosper. Within moderate distances and within certain limits of traffic density, the road that takes advantage of electrical power distribution to operate quick and frequent trains gets, and will continue to get, the lion's share of the traffic.

It seems, therefore, almost amusing to see the efforts made by some of the ultra-conservative steam roads to dodge the issue and to attempt to avoid the dilemma of operating electrically on the one hand, or, on the other hand, of confining their activities to a class of traffic in which at present they have the advantage. Every few weeks we hear that the X, Y & Z R. R. is going to put into service a new line of light and fast locomotives, or has contracted for gasoline motor cars for its suburban lines. Now, we believe that there is a field, and a good one, for gasoline motors. But in suburban service the thing which counts is ability to get to high speed quickly and to maintain that speed in trains running upon short headway. No motive power unable to meet such requirements amounts to much in this sort of service, and it has now been amply demonstrated that the many driving wheels and enormous power supply of an electric train gives it altogether unique powers of this very particular sort. There is very little use in theorizing about this matter—the steam railroad that most promptly realizes the facts and acts accordingly is the one that will lose the least money.

On the other hand, electric traction in the present stage of its development has also its limitations. It cannot help much in running fast through trains both from the limitations of electrical supply and from the impracticability of running very high-speed trains over the same tracks which are in use for a radically different sort of service. In heavy freight haulage, too, electric traction has as yet made very little headway. What it will finally do in these particulars is quite another matter, but we are speaking merely of the present. The problem of cheap, fast and convenient local traffic has been admirably worked out on electric lines, and for this service, as well as for some special applications, as described by Mr. Armstrong in this issue, electricity seems especially adapted.

There is not the slightest reason why both motive powers should not be freely used on the same system, as will presently be the case on the New York Central, and then the distribution of method best suited to the conditions can readily be worked out. The only objectionable feature of the operation of electric and steam service on the same system arises when a steam road attempts the benevolent assimilation of electric roads for the purpose of throttling competition. The public necessity is always for more and better transportation, no matter by whom it is furnished, and no sort of combination of interests that cuts down existing facilities should be tolerated for a moment. In many instances, however, electric roads can become valuable feeders for the trunk lines, and by whomsoever operated act to improve the general business of transportation. There is many a district which can profitably be exploited by an ordinary trolley line, while it would be but indifferently served by an ordinary branch railroad. In such case a steam road does well to build the trolley line or to lend a hand in building it, if itself unwilling to assume the whole burden. As a rule, active competition between an interurban electric line and an existing railroad takes place only where the ordinary railroad service has been outgrown by the needs of the community, for nowhere else can the electric road hope to prosper in competition. We believe that a good many railway managers are fully alive to the necessities of the situation, and year by year more of them will take to electric traction wherever it will pay. The paying field bids fair to increase year by year, but even the most enthusiastic advocates of electric traction hardly look for a wholesale change from present methods in the very near future. The suburban work on the New York Central will prove a very valuable object lesson which other roads will do well to study. One cannot successfully resist the application of improved machinery, whether of manufacture or of transportation, and the wise man will not be the last to move in the line of general advance.

A Weak Point in Repair Work

The principal work of any electric railway repair shop is the renewing of worn or defective parts in trucks and motors and the maintenance of car bodies. Car bodies in ordinary daily operation require little beyond cleaning. Trucks and motors require more frequent attention. The overhauling and thorough cleaning of motors and the renewing of bearings is a matter of regular routine. No small part of the total labor and cost of making motor and truck repairs is in the getting ready to make these repairs. Motors and brake rigging must be disconnected, car bodies raised and motors hoisted out of the trucks; or, if the work is to be done from the pit, motors and armatures must be disconnected and lowered into the pit and then taken out to some other part of the shop for cleaning and repairs. A large part of the shop labor goes into simply taking apart and getting together trucks and motors.

It is recognized in all classes of small manufacturing establishments that it is the make-ready cost which is most to be feared, and it is the same in the electric railway business. It is not uncommon to find electric railway repair shops finely equipped for turning out repair parts just as a regular factory would turn them out, but with exceedingly poor facilities for getting these repair parts in and out of trucks and motors. In other words, the cost of handling is too high. In large modern factories the cost of handling material is very carefully considered and everything possible is done to reduce this cost of handling.

In electric railway repair work where the cost of handling is such an important proportion, attention certainly ought to be given to keeping this cost down. There has been considerable improvement in the past few years in electric railway shop practice in this respect. Rapid disconnection of motor leads has been possible by mechanical connectors which replace the former soldered joints. Hand-operated jacks for hoisting car bodies and motors, as well as the slow hand-operated chain block, are giving place to hydraulic, pneumatic and motor-driven hoists, and overhead cranes and carriers with which one man can do the work which formerly required three or four. All facilities of this kind for quickly handling motors, car bodies and trucks mean more than the direct saving of men required to do a certain operation. They usually mean the saving of the time of several other men who are waiting for those actually doing the work to get various parts clear to work on. If some of the smaller companies would look more carefully into the cost of getting repair parts into and out of car equipments rather than attempting to split hairs on the cost of manufactured repair parts, their energies would be better directed. Many repair parts can be bought very cheaply in the open market because of competition and the perfection of manufacturing processes, but there is no competition in the cost of handling motors and trucks in the repair shop, and for that reason there is apt to be greater laxity.

Another Single-Phase Road

It gives us much pleasure to record some details of the new Bloomington, Pontiac & Joliet electric road started a few weeks since. The project is notable as including in its final form a road long enough to bring out the real advantages of an alternating-current distribution, although only the first section of a little over 10 miles is already in operation. When the full 90-mile line is working, the value of the high-voltage trolley wire will be conspicuously brought out. A feature of interest is the collection of current from the 3300-volt trolley wire by means of an ordinary trolley wheel. All the experience yet acquired with high-voltage working conductors seems, in fact, to point to an ease of operation very gratifying to the engineer. It has certainly been proved that at any voltage that one would care to use on an overhead trolley wire current can be successfully taken without any of the difficulties which were at first feared. Just how far the trolley voltage should be pushed without passing to the Zossen device of side contact cannot yet be determined, but the limitation probably lies in the speed of the car rather than in anything else, since it would not be difficult to make such provision for safety that the trolley wire could not come down far enough to hit the car without cutting itself out. The catenary form of construction is especially well fitted for this high-voltage work and greatly facilitates high car speeds, such as should be attained on this line after a greater length has been completed.

The motor equipment of four 75-hp motors is certainly ample for putting the cars over the track in a very lively fashion, and the road, with its probable final connections to Chicago and St. Louis, may prove to be favorable for trying high-speed experiments later on. We doubt not, too, that later means will be found for working these single-phase motors at a considerably higher voltage than 200 per motor, so as to avoid the steady operation in series which is now employed. We have been slow in this country in getting single-phase roads into actual operation, but now that they are fairly going, we shall expect to get the engineering details of operation that will give a clearer idea of the applicability of the system to larger work. If a 75-hp motor can be counted on for regular, efficient and sparkless operation, it will not be a long step to the operation of a 150-hp or 200-hp motor, and with four of these latter per car the way will be made clear for railway operations on a large scale. Steam railroad men will watch the working of these initial single-phase plants with the keenest interest, for, as we have many times intimated, the key to the larger railway work is in high voltage on the working conductors so as to permit the operation of a road in long sections. High-voltage distribution is relatively fruitless if the road must still be fed by a large number of sub-stations upon which it is well nigh impossible to keep up a decent load factor, save in the case of very dense traffic. With the possibility of feeding 50 miles or more of track from a single transformer station will come different conditions, permitting the electrical equipment of many roads which are not now practicable for electric traction.

The general equipment of the line here considered seems to have been very carefully worked out, and it is interesting to note the comparatively small additions needed to fit the system for operation on direct as well as upon alternating current. We cannot help feeling, however, that the importance of this feature has been somewhat overestimated, for the larger work in which alternating motors can be of most value is very largely on long lines working somewhat independently. Unquestionably there will arise cases where direct current working at the termini will be useful, but a motor which can be successfully fed from a high-pressure trolley wire is of the first order of importance, quite outside of the additional feature considered. The thing most needed now is more knowledge of the real operative qualities of alternating traction motors, and with the roads now running, this should be rather quickly acquired, for in the present state of electrical engineering inconsequential difficulties can be readily distinguished from real ones. One feature of the motors in this new road is their very moderate weight for the output, not at all extraordinary, of course, for traction motors of modern design, but very encouraging for a radically new type laboring under some inherent disadvantages in the matter of weight efficiency. Of course, in rapid acceleration single-phase motors are at present rather at a disadvantage, but after all, for the class of work on which they are most likely to be used extreme acceleration is usually not a vital matter, and electric motors are in this respect so far ahead of ordinary locomotives that one need not worry on this score. Altogether the outlook for single-phase commutating motors seems more promising than it did a short time since, and we hope that engineers will be encouraged to give them a thorough trying out instead of fighting a bit shy of them, as they have rather been disposed to do. In everything of this sort it should not be forgotten that electrical engineering has reached a point where results can be predicted with more certainty than a few years ago, and there is far less likelihood of serious mistakes. We wish the new road a long life and a happy one.

Coal Mine Ownership by Electric Railways

There has been a noticeable movement lately among electric railway, light and power companies, which are large consumers of coal, to procure their own coal mines so as to control as far as possible the supply of coal needed to keep their properties in operation. Not a few interurban roads are now in a position where they can haul considerable coal for their own use and for retailing along the line. As coal prices seem to have a steadily upward tendency, there would seem to be considerable wisdom in getting hold of good mining properties at this time rather than to wait until later, when prices on coal and coal mining properties have advanced.

NEW SEMI-CONVERTIBLE CARS WITH STEEL UNDER-FRAMES, FOR THE BROOKLYN RAPID TRANSIT COMPANY

One of the most important of the many recent improvements upon the Brooklyn Rapid Transit Company has been the recent

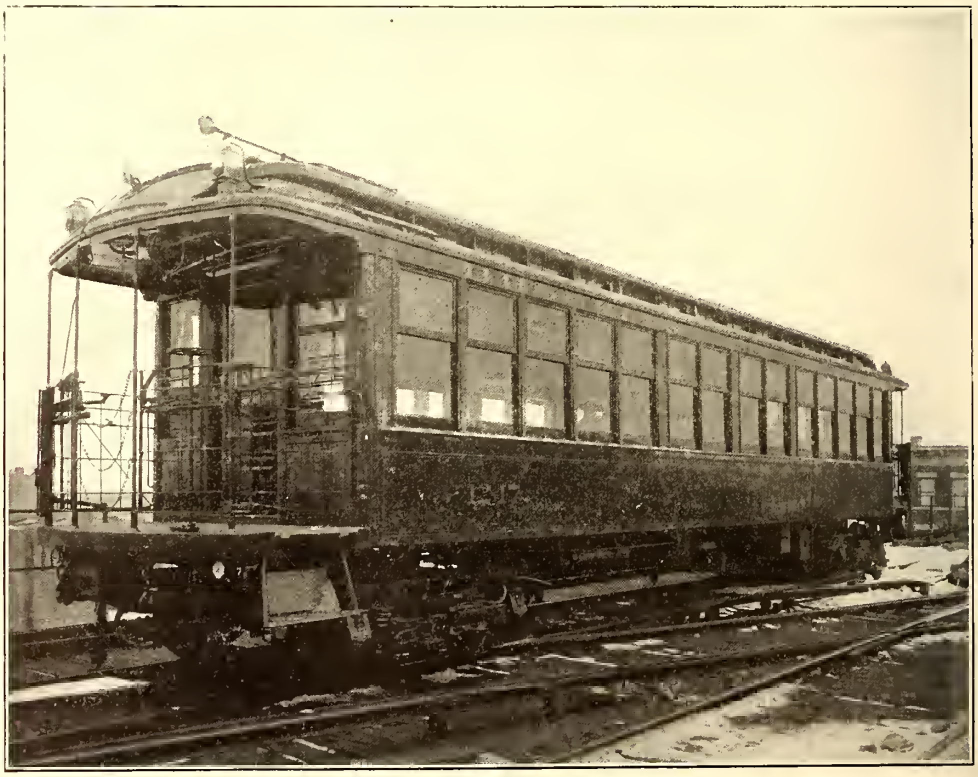
INTERIOR OF THE NEW BROOKLYN SEMI-CONVERTIBLE CAR

extension of the use of the electric motive power to the few remaining elevated lines which had been up to last fall operated by the original steam locomotives. This was made possible by the final completion of the large central power plant of the company last summer. It made necessary, however, a large increase in the elevated rolling stock equipment to replace the steam trains. Not even the extensive work of reconstruction and re-equipping of the old steam coaches and miscellaneous elevated passenger car equipment, as inaugurated last year at the large Thirty-Ninth Street repair shops of the company, could supply the needed equipment fast enough to satisfy the demand.

As was noted in the articles upon the reconstruction work in the Aug. 13 and 20, 1904, issues of this journal, the elevated cars have been practically rebuilt in those shops, being heavily strengthened in all parts and, in addition, equipped according to the newly-adopted standards of under rigging, brake and draft rigging, platform standards, electric wiring, inside detail, etc. The rebuilt cars have been turned out very rapidly, and up to the present time fully 400 cars have been passed through this heavy overhauling process. But it was foreseen early last year that, with the present rate of development of traffic in Brooklyn, a considerable additional equipment would soon be required to handle the rapidly increasing business. During the past few years the records show that the traffic in Brooklyn has grown far more rapidly than provisions could be made for handling it.

To provide in advance for the inevitable development in this department, and also to provide a suitable amount of reserve equipment, an order was placed, in 1903, by the company for 100 elevated cars to supplement those already in use by the company. These cars were delivered last fall and are now largely equipped and in service. They involve many radical departures in car construction, both as to framing methods and as to provisions for catering for the very heavy summer traffic with which the Brooklyn elevated lines leading to the ocean summer resorts are favored. For the latter purpose, the cars were designed upon the semi-convertible plan, whereby the attractions and comforts of summer riding might be obtained in full. As to construction, the use of steel has been made an important factor in accordance with the latest ideas of car design. A novel design of self-supporting underframing has also been adopted, by means of which a perfect alignment of body is secured without the usual type of under truss rods.

These cars do not differ in general appearance from those now in use upon the system; they are of the end-door type with open platforms, and the seating arrangement is of the well-known "Manhattan" type. The motormen's cabs are located within the body of the car, occupying the space of one window each, as indicated in one of the plan drawings of the car. These cabs embody the convertible arrangement by which, when not in use, the seat is available for the use of passengers, in accordance with the standard design illustrated in the article upon the reconstructed cars of this company above referred to. As will also be noted from the exterior view of the car, the platforms are provided with steps and lifting trap doors by which the cars may be made available for either elevated or surface operation. This is necessary, as the elevated lines leading to Coney Island and the other ocean resorts cover more than half of their mileage upon railways upon the surface, using the former



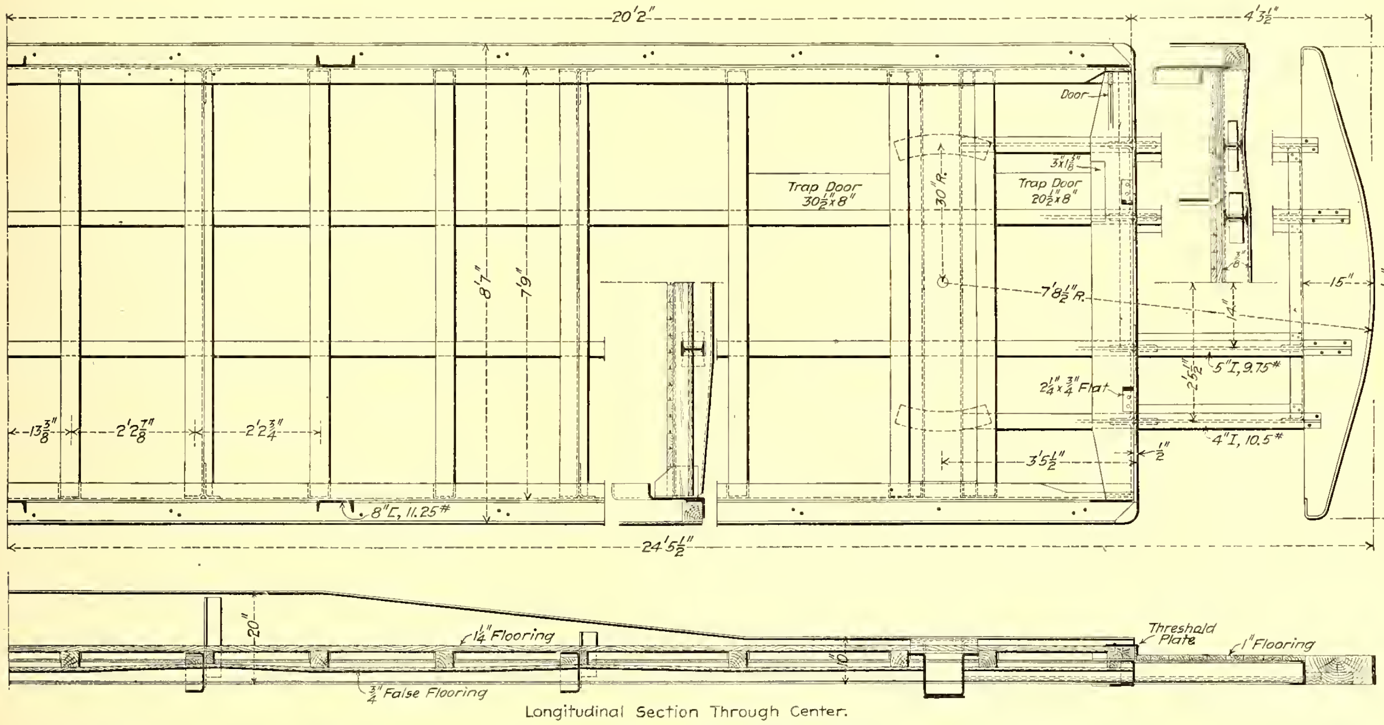
THE NEW SEMI-CONVERTIBLE CAR WITH STEEL UNDERFRAMING FOR THE BROOKLYN ELEVATED LINES steam-operated lines. As to dimensions, also, the cars resemble those at present in use upon the elevated lines of this company. The total length of the cars over all is 49 ft., while that over the closed portion of the body is 40 ft. From this may be noted the generous widths of platforms that have been provided, this being an important feature when operating under conditions of heavy city traffic. The extreme width of the body is 8 ft. 7 ins., while the height over all is 12 ft. 6 ins.

CAR FRAMING

Accompanying drawings illustrate the interesting features of construction of the steel underframing and the body framing. As may be noted, the underframing proper is constructed entirely of steel, although the platform members are reinforced with wooden fillers, as shown in the platform section. The center sills consist of 5-in. I-beams running continuously throughout the underframing from one buffer beam to the other and spaced 28 ins. between centers; at the platforms, however, two additional 4-in. I-beams are carried out to assist in supporting overhanging weight. The side sills embrace a peculiar girder construction, as illustrated in the cross section. Each is in reality a Z-bar of varying width, the width starting in at the ends at 12 ins. and increasing near the middle to 20 ins., as shown. The Z-bar is built up of a specially shaped angle, with an inwardly projecting lip 4 ins. in width on the upper edge, while at the lower outside edge is riveted a heavy 4-in. angle so as to form an adequate stiffening against side bending as well. It will be noticed that the increase in width of the girder side sill takes place at a point about opposite the body bolster and becomes maximum at a point about 12 ft. toward the center of the car. Inasmuch as the formed portion of this side sill is of 3/8-in. plate steel and the lower angle a 4-in. x 4-in. x 3/8-in. angle, it is evident that a very stiff, serviceable girder construction is the result.

The strength of the underframe was found to be such that the usual style of under-truss rods, as ordinarily used for preserving the alignment of the car body, are not found necessary. The resulting appearance of the car is, as may be noticed from the photographs, very pleasing. In addition, the amount of space economized by the elimination of the truss rods was found very favorable in the equipment of the car with its electrical apparatus. The objection that might be offered to the inwardly projecting lip upon the side sill member is rendered of little value by virtue of the fact that the side seating arrangement is used in these cars. In this way this projection does not interfere in the least with the seating arrangement in the interior of the car. Where this projecting lip comes to view between the center cross seats, it is in each case covered with a special ribbed malleable-iron casting, which gives it a neat and finished appearance.

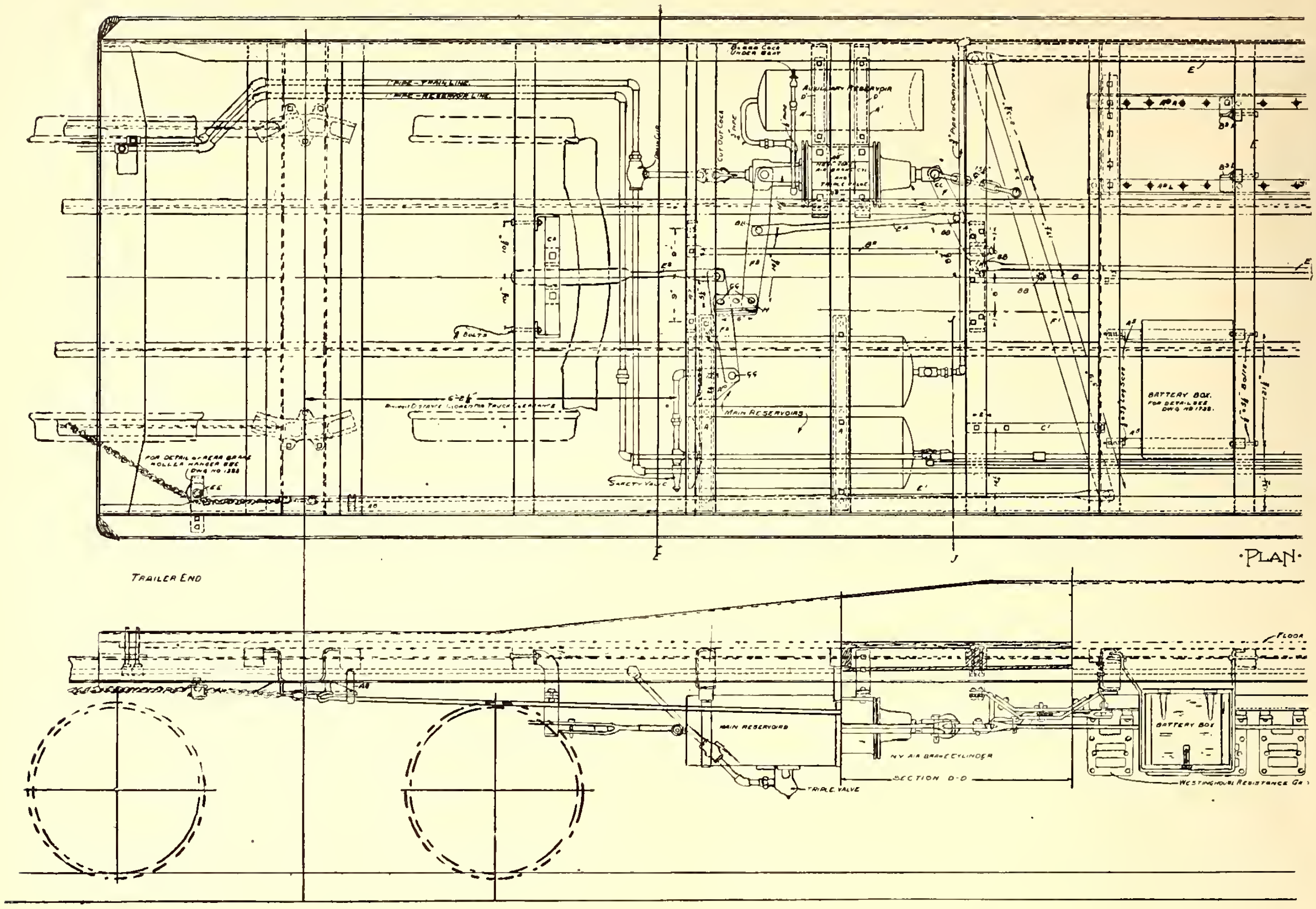
In the side and roof framing a novel construction is used by the combination of wood and steel. The side framing is primarily of wooden construction, although the window posts are made comparatively light, and are thence reinforced by 1/2-in. steel rods passing from beneath the heavy side-sill girder member up to and through the forged foot of the steel carline above the plate. This novel construction is made possible by the use of steel carlines, which are of special steel forgings, with feet having a bearing surface of 3 ins. x 4 ins. upon the plate. The post bolts pass up through these, and thus serve to very effectually stiffen the side frame construction, as well as also the roofing.



DETAILS OF THE STEEL UNDERFRAME, SHOWING CONSTRUCTION OF THE PLATE GIRDER SIDE SILL

The roof framing is of light composite construction built up upon the steel carlines. The wooden carline members are bolted to each side of the steel carlines at six points by 3/8-in. bolts, thus forming a very strong and yet light construction. The further details of construction of the plate and side deck sills, also of the hoods, do not differ materially from that used in the other cars of the company, the novelty introduced being in the introduction of steel reinforcing members, by which the car frame is rendered very stiff and rigid with much less weight than would be required in equivalent wooden construction.

A novel design of window post construction is used at three points on each side of the car toward the center, which are opposite the backs of the cross seats; at these points 11-lb. 8-in. steel channels are inserted vertically for frame stiffening, being heavily riveted, as indicated in the underframing plan, to the large side sills and extending upward to the plate. These channels are forged L-shape at the top beneath the plate for bolting through that member to the feet of the carlines above. This construction is perhaps more effective than double the



DETAIL UNDERFRAMING PLAN OF THE NEW BROOKLYN ELEVATED CAR, SHOWING ARRANGEMENT OF ELECTRICAL AND AIR-BRAKE APPARATUS

amount of diagonal bracing as used would have been if these channels were omitted. The result of this interesting arrangement of combined steel and wooden construction has in fact been to produce one of the stiffest and most rigid types of construction that has up to this time been designed for a car of the light weights used in this class of service.

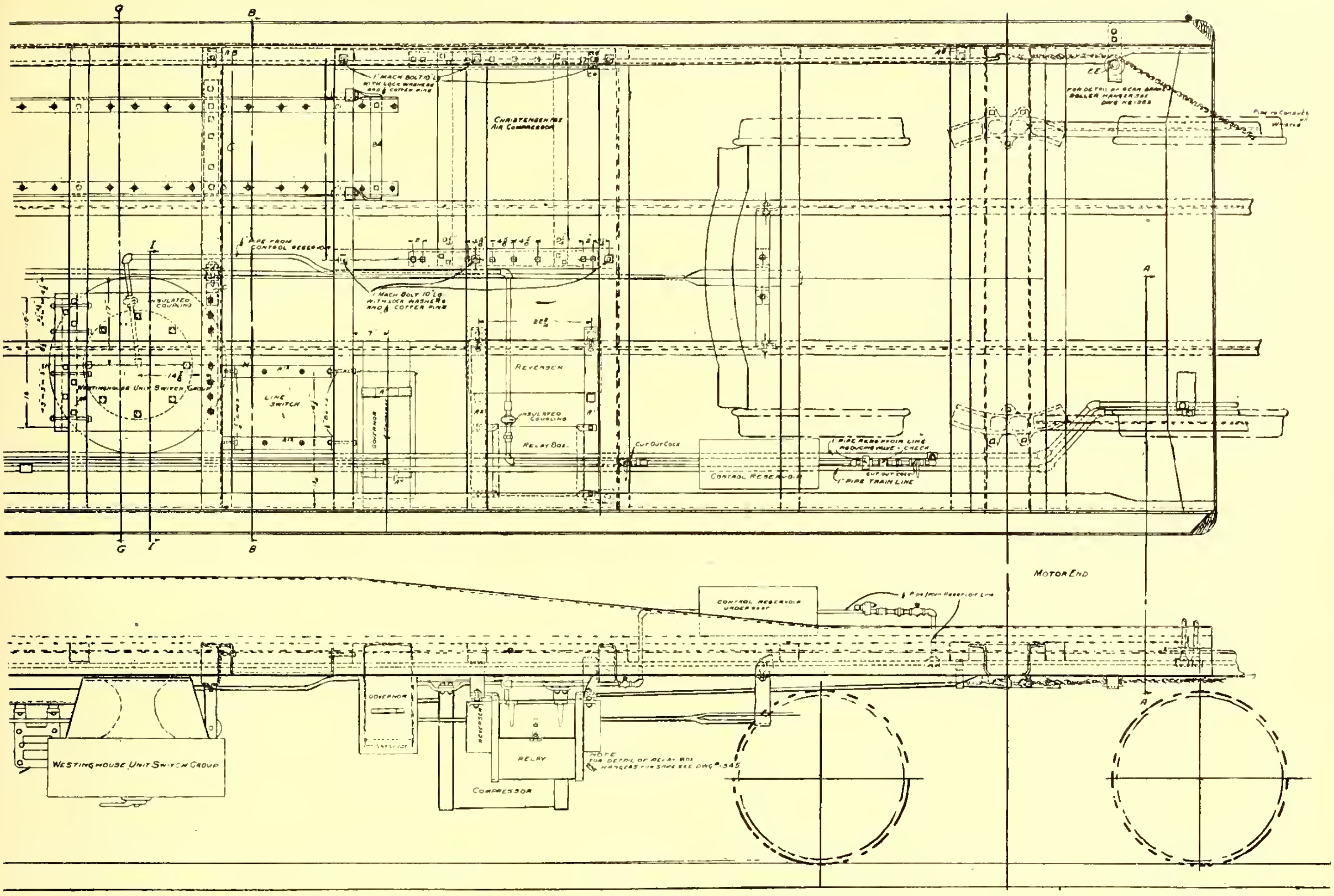
PLATFORM DETAILS

The design of platform details follows very closely those enumerated in the article upon the reconstruction of the old equipment in the Aug. 13, 1904, issue of this journal. In the rebuilding of the old rolling stock of the company a standard car end arrangement was worked out and adopted for all of the rolling stock of the system, and to this design the new cars are made to strictly conform. The accompanying engraving of platform details shows the application of this standard arrangement to the steel underframing construction of the new cars.

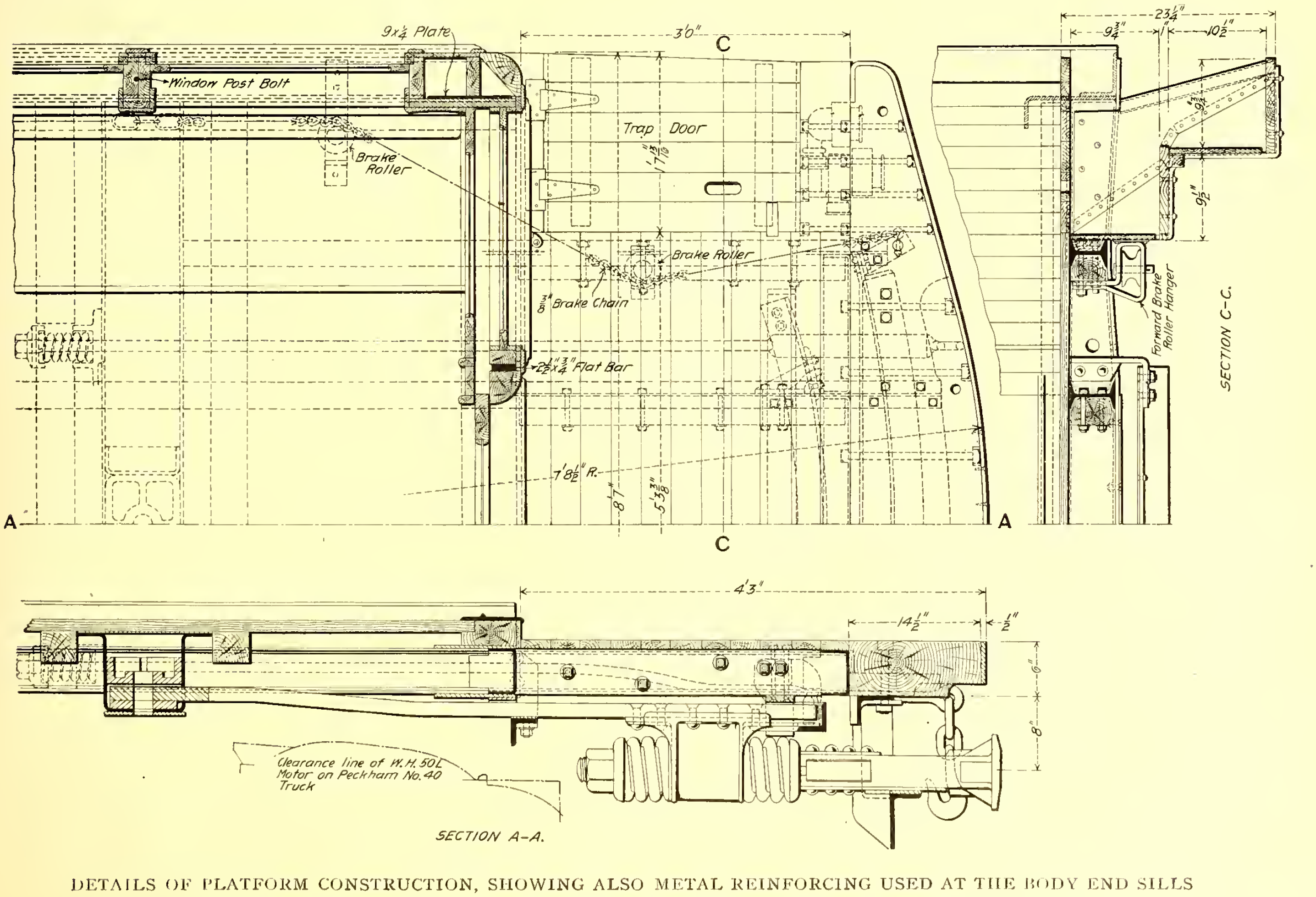
As above noted, the platforms are carried partly by the 5-in. I-beam center sills of the car which extend through past the body bolsters to the end buffer beams, and partly by two outside 4-in. I-beams which project from the body bolster also out to the end buffer beam. For additional stiffening, these I-beams are in all cases reinforced with wooden fillers machined to fit into the contour of the I-beams at the sides, as shown. This provides also the means for fastening the platform floor work, besides stiffening the general platform construction.

The arrangement of draft rigging, air-brake pipe, safety chain connections, jumpers, steps, etc., conform to the newly adopted standards. The safety chains are connected to the car underframing by means of pull rods extending back under the platform and through the body bolster. Upon the opposite side of the body bolster a special spring block is arranged to cushion the shock of a sudden jerk on the chain. The arrangement of chains is in accordance with the standard platform design, the hook being hung with two links upon the left-hand side of each car end, and the longer portion of the chain, of eleven links, upon the right-hand side. The air-brake hose are arranged one above the other below the sector bar, which is found serviceable in supporting the pipes. Four and seven-point jumper couplers are carried to the extreme outsides of the platform, as indicated. As referred to in the above-mentioned article in the Aug. 13, 1904, issue, the Van Dorn automatic couplers are standard upon the Brooklyn Elevated lines, the type 4-A being used at the motor ends of cars, as here shown, and the type 18 at the trailer ends. The new Pitt "platform balance" gate, which has proved so successful in use upon the Brooklyn Elevated cars, is used upon these new cars, having been adopted as standard for all new work.

One of the novelties of the platform construction lies in the introduction of a special design of metal step, which, in addition to being stronger and more serviceable, will be much more safe for the use of passengers. This step, as shown in the drawings, is built up of ¼-in. sheet steel, being carried upon forged supporting straps. The end supports are of similar steel plates, with the edges rolled over to present a smooth and pleasing appearance. As may be noted at the lower corner which faces toward the wheels, the entire corner section is beveled off to permit of the free swiveling of the truck in taking curves. The treads are, of course, of wood, as this is the safer material in slippery weather. Trap doors are provided to drop down over the steps when the cars are in service upon the elevated structure; when lifted they are retained in folded position by an ingenious spring catch, which is simple and effective.



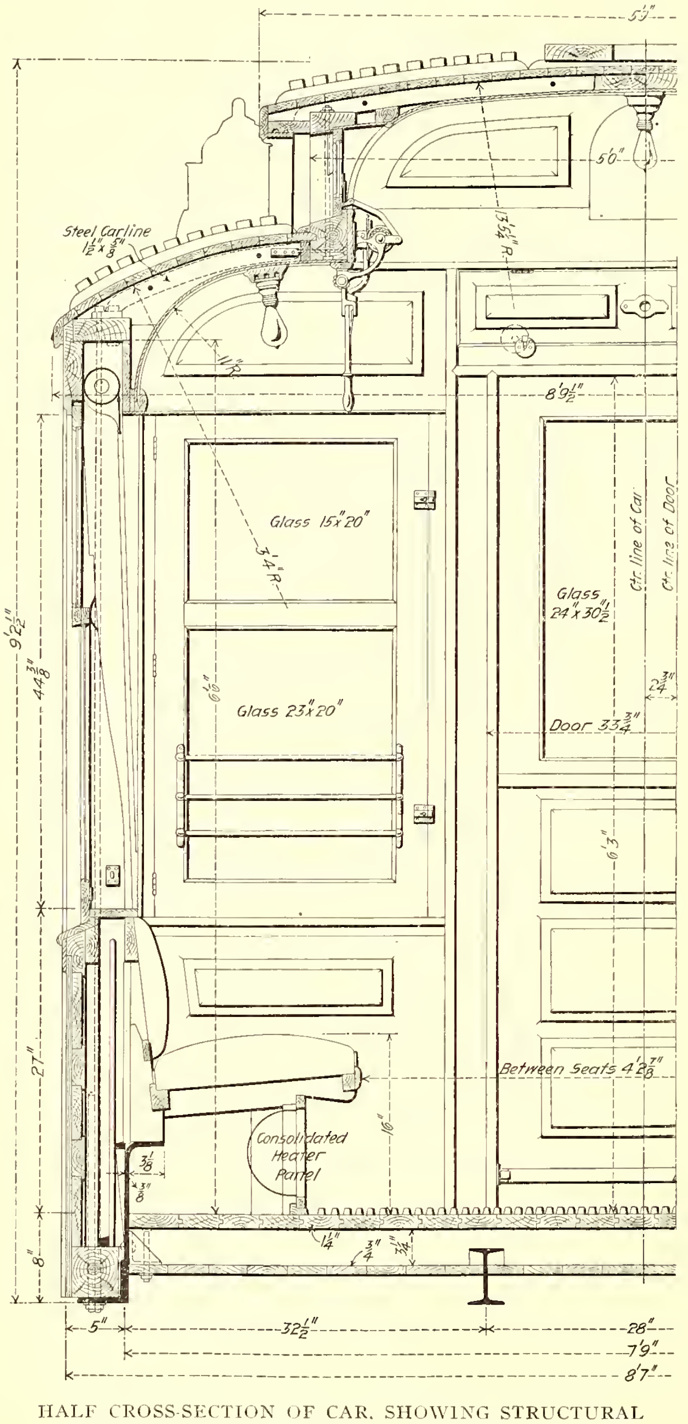
CONTINUATION OF THE DETAIL UNDERFRAMING PLAN OF THE BROOKLYN CAR, FROM THE OPPOSITE PAGE



DETAILS OF PLATFORM CONSTRUCTION, SHOWING ALSO METAL REINFORCING USED AT THE BODY END SILLS

INTERIOR FINISH

Features of novelty have been introduced into the interior finish of the car, as are illustrated by both a part cross section of the car and a photograph. The most noticeable are, first, the extremely plain finish of the woodwork and tendency to avoid all unnecessary moldings, brackets or other form of dust catchers, and second, the use of a headlining finish of pure white, which, with the lamps arranged on the single outlet system, greatly facilitates the lighting and gives the cars a very bright and attractive appearance. The cars are beautifully finished in cherry, in very attractive designs of woodwork detail. This is also tastily set off by the half-empire finish of deck interior.



HALF CROSS-SECTION OF CAR, SHOWING STRUCTURAL FEATURES AND DETAILS OF INTERIOR FINISH

A feature noticeable in the interior view is the low level of the window sills, this being one of the important factors in the semi-convertible construction. The window sills were kept as low as possible without rendering the seat backs inconvenient, so as to increase the possible window opening to the maximum for summer operation. As may be noted from the part cross section through the car, both sashes of the window are arranged to drop down into the window pockets beneath the sills. The sills in all cases consist of covers which close over the pockets, being held normally shut by a convenient spring catch, but easily opened. The process of dropping the windows into the pockets is simple and easy for the passengers; after opening the pocket cover the two sashes are merely lifted out of their sockets and lowered into the two grooves, as shown. The large lower sash cannot be dropped into the wrong pocket, owing to the peculiar shape of the guiding strips. Furthermore, the windows cannot be harmed by dropping too hard, owing to rubber lining at bottoms of the pockets.

The doors are of ample width to give the freer access to and from the car necessary in handling the New York crowds. They are hung on an overrunning track, so as to roll freely, and the door lock is of the new "subway" type of spring catch, the mere pulling the handle of which, in opening the door, serves to unlock the catch. This detail is now a standard for the company, the locks being manufactured by James L. Howard & Company, Hartford, Conn. The seats for the cars are of the rattan-covered type, as formerly used by this system, the equipments for seventy-five of the cars having been supplied by Heywood Brothers & Wakefield, and those for the remaining twenty-five cars by the Hale & Kilburn Manufacturing Company. The curtains are the standard Acme cable fixture of the Curtain Supply Company, in which J color 74 morocco Pantasote is used. The electric heaters were supplied by the Consolidated Car Heating Company throughout. Each motor car is also equipped with one of the portable chemical fire extinguishers of the Fire Underwriters' type for emergency use in case of fire.

UNDERRIGGING

The arrangement of apparatus underneath the car is interesting and novel on account of the use of the latest design of multiple-unit train control of the Westinghouse Electric & Manufacturing Company, known as the "unit switch group" control. The type of control apparatus formerly used in Brooklyn involved the earlier form of Westinghouse pneumatic control, which was located in a closet above the floor, in one corner of the motor car; the improved "unit switch group" form of controller, however, brings all the apparatus beneath the underframing, as indicated in the accompanying underframe detail view. This not only frees all available space above the car floor for passenger carrying, but also places the control apparatus together beneath the floor, where it can be most easily and effectively inspected and cared for, and moreover, can be properly fireproofed. The arrangement adopted has proven very convenient and well adapted to the requirements of the service, and merits careful study.

It will be noted that, in general, the electrical equipment is located at the motor truck end of the car and the air-brake apparatus at the opposite end, this arrangement bringing the controller as close as possible to the motors, which results in keeping the motor leads, as well as those also to the resistance grids, to the shortest possible lengths, an important feature in saving of wiring and maintenance. The eleven resistance grids and the air compressor are located upon one side, and the "unit switch group" controller, its battery box for the operating storage batteries, the line switch, air-compressor governor, the motor reverser and the control relay are on the opposite side of the car. They are thus well spaced so as to facilitate installation and attendance. The details of the control equipment and many interesting improvements that have recently been made in it will be referred to in another part of this article.

An interesting design of brake-lever system is to be noted in the underframe plan. The brake cylinder is located very close to the center of the car so that the brake rods extend directly to the brake-system sectors upon the trucks, the arrangement being most simple and effective. The hand-brake system operates through a long cross beam pivoted at the center of the car, with a chain connection to the air-leverage system at the brake-cylinder piston and to the platform brake staffs through pull rods at the sides of the car. This latter arrangement is of great convenience in connection with the electrical equipment, as it removes all rods and levers entirely from that portion of the car. The remaining details of auxiliary apparatus are clearly apparent in the drawing.

Of these new cars, which are known as the "1200 series" of the company, the total number received is 100, all of which are now completed, and sixty of which are now in operation. The remaining forty are now being equipped with their electrical apparatus and will be ready for operation by the time the heavy summer business opens up in full. These cars were built in three lots by different builders, as follows: Forty by the Laconia Car Works Company, Laconia, N. H.; thirty-five by the Osgood Bradley Car Company, Worcester, Mass., and twenty-five by the J. G. Brill Company, Philadelphia. The trucks for the entire 100 cars were furnished by the Peckham Manufacturing Company, Kingston, N. Y., and are of the type-40 M. C. B. "Brooklyn Heights special" of this company. The wheels used are the Taylor steel-tired wheels with 2¼-in. tires, with exception of three cars under which the Schoen rolled steel wheels will be tried.

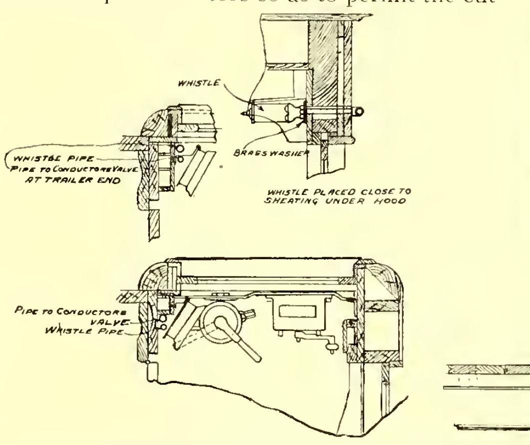
TRAIN-CONTROL SYSTEM

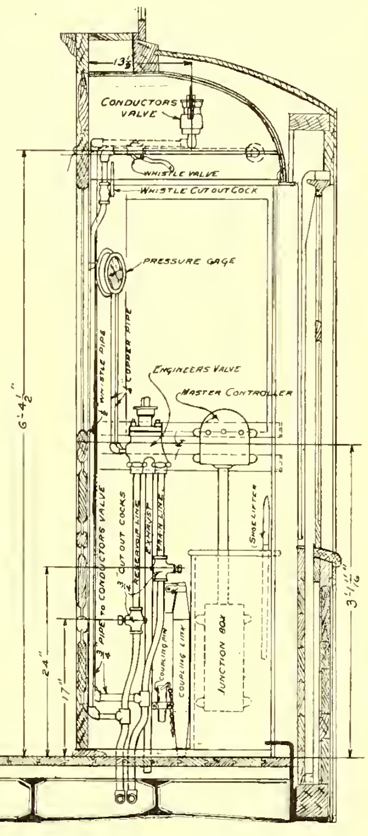
As above stated, the Westinghouse system of multiple-unit control is being applied to these new cars in its latest improved form. This system was described in detail in the Sept. 26, 1903, issue of the STREET RAILWAY JOURNAL, but since then it has been largely remodeled and many important improvements added. The system as applied in Brooklyn, and recently also to the cars of the Metropolitan West Side Elevated Railway, of Chicago, involves important changes in the master controller, the unit switches operating the contacts in the motor circuits, the reverser, etc. Reference was made to the Metropolitan West Side installation in the April 22, 1905, issue of this journal. Before referring in detail to the features of improvement that have been made upon the system, a brief review of its salient points may be of interest.*

The main controller for each motor car consists of a series of "unit switches," or electro-pneumatically-operated contactors, grouped in a circular case beneath the car underframe, each individual switch or contactor being operated by compressed air which is controlled by an electro-pneumatic valve and interlock of construction similar to that used in electro-pneumatic signaling. Extreme compactness and simplicity was secured by the adoption of the "bridging system" arrangement of motor circuits for the control, in contradistinction to the older series-parallel arrangement of circuits, whereby only thirteen of the unit switches are necessary for the same results as are possible with the bulkier and more uncertain older type of series-parallel control. The unit switches are thence closed in various combinations, for the control of the motors, by a 14-volt battery current through the master controller; for this only seven wires are required for the control line leading throughout the train, and furthermore, as this control current is a low-voltage battery current, it is easily insulated and is available at all times, even when the power current supply may be shut off, due to blowing a fuse, etc.

In detail of construction, the unit switch group (formerly known as the "turret") consists of the thirteen electro-pneumatic or unit switches arranged radially on a cast-iron frame around an air reservoir from which the operating supply is taken. Each switch is operated by an air cylinder against a 70-lb. spring, which is effective in quickly forcing the piston back, when opening the switch, in order to give a rapid break. The circular arrangement of the switches permits one magnetic blow-out coil to cover them all, and as the magnetic field is horizontal, the arc is blown out radially. Its operation is very simple: the first position of the master controller throws the reverser and closes the circuit breaker, the second places all motors in series with resistances in, the third starts the cutting out of the resistances one by one, while the fourth throws the motors in multiple with all resistances in, which then, however, begin to cut out one by one automatically.

The rate of acceleration, or the rapidity with which the resistance is cut out of the motor circuits, is dependent upon the amount of current flowing in the circuit of one of the motors. A limit switch is provided, which permits the control apparatus to advance one point whenever the current falls below a predetermined value for which the limit switch is set. The practice on the Metropolitan Elevated is to set this limit switch on cars equipped with GE 2000 motors so as to permit the cutting out of more resistance whenever, during acceleration, the current falls below 215 amps. On the GE 55 and Westinghouse 109 motors this limit switch is set for 250 amps. The practice upon the Brooklyn Elevated lines, where type 50-L Westinghouse motors are used, is to set the limit switch for 260 amps.

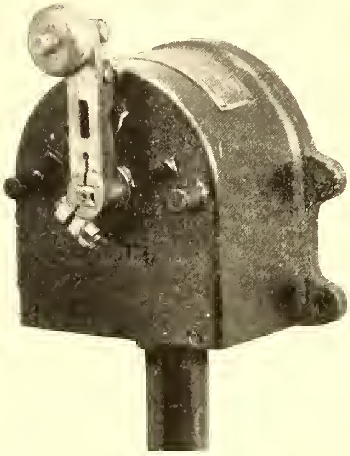




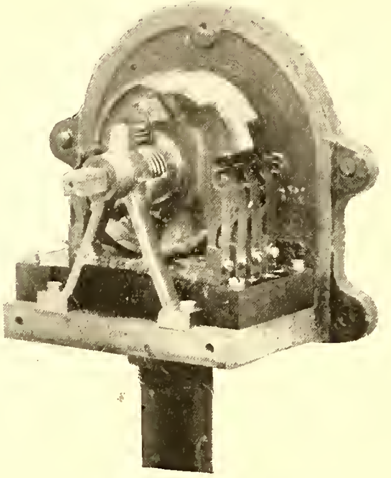
ARRANGEMENT OF CONTROL AND BRAKE APPARATUS IN MOTORMAN'S CAB

The automatic acceleration by the limit switch, just referred to, is obtained in a very ingenious manner. Each electro-pneumatic valve has two magnet coils, one of which is an operating coil, the other a holding coil. When current first flows through a circuit to one of the electro-pneumatic valves, it flows through the operating coil and operates the valve to close the corresponding switch or switches of the main circuit by turning air into the air cylinders in the turret. As soon as the main switch is closed it cuts into circuit the holding coil of its corresponding electro-pneumatic valve, and this coil will hold the switch closed without regard to the action of the limit switch. This prevents the switches from opening after they are once closed, otherwise they would open when the limit switch acted, and as the limit switch acts after each step the controller advances, there could be no acceleration if a holding coil were not provided. These contacts, termed interlocks, which automatically cut in the holding coils, are shown in the upper portions of the switch-operating cylinders.

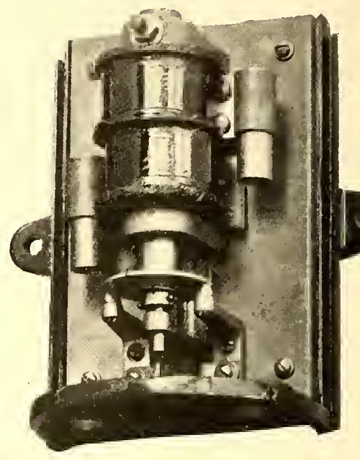
The controller circuits are supplied from two 7-cell storage batteries hung under the car, one of which is in use while the other is being charged. Two double-throw switches are provided for changing the batteries from control circuit to charging circuit; each switch controls one battery. The motormen are instructed to throw these switches every day, with handles pointing upward on even days of the month and down on odd days, so that each battery is charged every other day. The charging is done by placing the battery in series with a lamp circuit or the compressor motor. Compressed air for operating the main switches is supplied from the reservoir line of the air-brake system, but a separate controller reservoir is provided and connected to the reservoir line through a check valve, which would prevent the air from escaping from the controlling reservoir if the air pressure in the reservoir line were lost.



THE NEW WESTINGHOUSE MASTER CONTROLLER



INTERIOR VIEW OF THE MASTER CONTROLLER



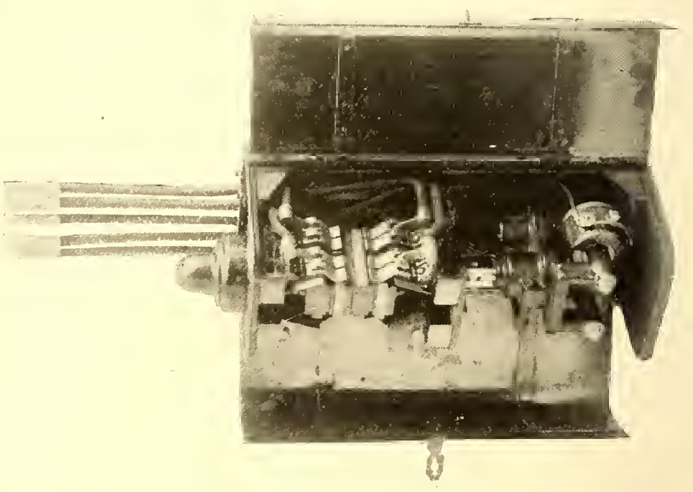
THE LIMIT SWITCH USED IN THE CONTROL SYSTEM

The main line switch, which is also an automatic circuit breaker, is located under the car, and has a reset coil by which the motorman in any controlling cab can reset the circuit breakers on his entire train by momentarily closing a single-pole switch. He can also trip the circuit breaker by opening a similar switch located beside the resetting switch in the cab. For the use of the shop men testing the equipment, the circuit breaker is also arranged so that it can be set and tripped from under the car.

The recent improvements to the control system involve many of the more important details of the apparatus. The construction of the switches, or contactors, has been very materially changed, as has also that of the switch-operating cylinders and interlock mechanism. The reverser and master controller are also of considerably different construction from that illustrated in the article already referred to as having appeared in the issue of Sept 26, 1903. The details of the present forms of the apparatus are shown in the accompanying drawings and half-tones. A diagram of the new "bridge system" of connections for the unit switch group control is also presented, and from it the operation of the system will be evident.

Referring first to the unit switch group, or main car controller, it will be noticed at once that the construction of the switch-operating pneumatic cylinders have been so changed as to include the "interlock" contacts within their cylinder spaces. This does away with the extension chambers formerly used for this purpose. The contact arms are hinged in a new way, with a long, easy spring, which is compressed in closing the switch; the action of the hinged arm under spring tension is to cause the wiping contact effect, which is so desirable in keeping the contacts clean. An important alteration has also been made in the arc deflectors by the use of a heavy soapstone cell for cooling the arc and contact arm, and also a heavy new electrobestos shield is used in lining the unit switch pockets.

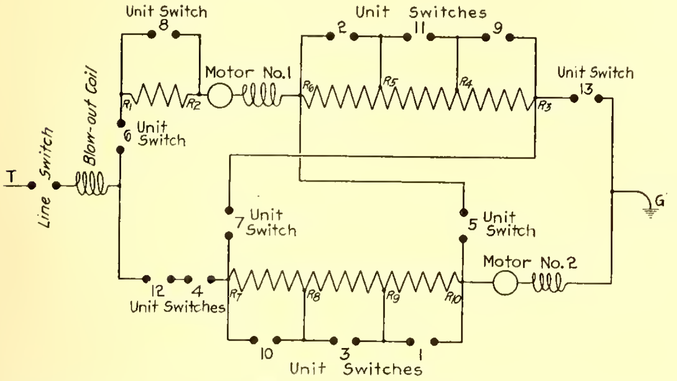
The reverser is now entirely enclosed in a protecting case and several details of a minor character in its construction have been introduced. The most important is the use of the protecting casing, which now encloses the air valves as well as the reverser contacts. The master switch is of a new pattern, with a horizontal shaft, as illustrated in the accompanying views; in this form it is much easier to care for, as all parts are readily accessible. Moreover, this form does not introduce insulation difficulties, as the potential used in the control circuits is only 14 volts. The limit switch is also illustrated in its latest form; the contacts in this switch are of solid platinum discs and tips, so as to make the device not only sensitive, but most reliable in service.



THE NEW TYPE OF REVERSER USED WITH THE UNIT-SWITCH-GROUP CONTROL

The method of operation of the motor circuits as carried out by the unit switches is made clear by the accompanying schematic wiring diagram of the motor circuits as established upon each car. The actual details of arrangement of all the connections, for both the low-voltage control circuits and higher-voltage motor circuits, and also the line switch, reverser, line relay, limit switch, etc., for his control system, are shown in the diagram of connections presented in the April 22, 1905, issue (page 733), which, owing to the similarity of those applied to the Brooklyn cars, will not be here reproduced. There are some very slight differences in the detail of application to the Brooklyn car, although the general features of the system are identical.

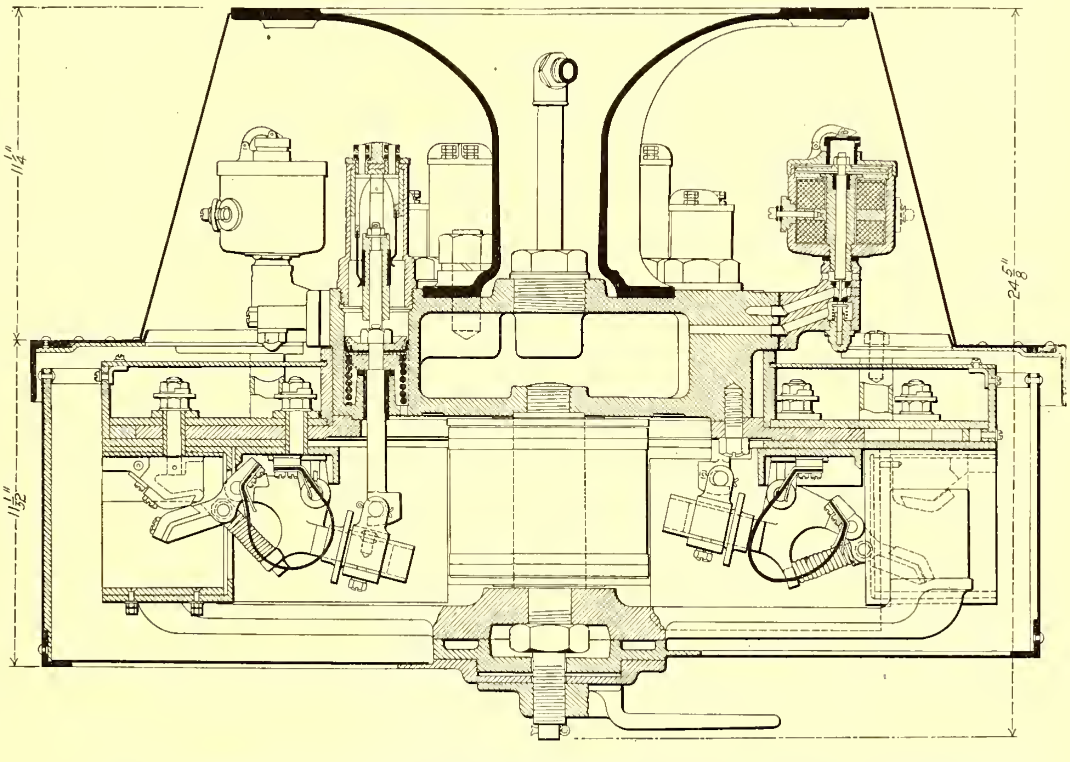
As may be noted from the accompanying diagram, the motor connections are very simply arranged; the unit switches control all parts of the system, and by them the various steps in



SCHEMATIC DIAGRAM OF THE MOTOR CIRCUITS AS ARRANGED UPON THE BRIDGING SYSTEM

acceleration are taken without once opening the main circuit. In starting a car or train, the control system first closes the line switch and then unit switches 6 and 7; this throws the motors in series with all resistance in, after which the procedure in accelerating is that of cutting out the resistances in turn by closing switches 8, 9, 10, 11, 3, 2 and 1 when the motors are in full series. In proceeding to the multiple position, switch No. 5 is closed and all other switches except 6 and 5 released; this action causes the closing of switches 4, 12 and 13, and the subsequent opening of switch No. 5, placing the motors in multiple with resistance all in. The further steps to full multiple are effected by closing switches 9, 10, 11, 3, 2 and 1 to short-circuit the resistance as in the series steps. The action is very simple, the various acceleration steps in both series and parallel being made automatically by means of the limit switch.

The new unit switch group system is now in use upon over 150 cars of the Brooklyn Elevated lines, and will be placed upon the 100 new cars that were recently ordered for next year's delivery. The system has been found well adapted to the service requirements, the simplicity introduced in the new design being an important advantage in its operation and maintenance.


DETAIL CROSS SECTION OF THE WESTINGHOUSE UNIT-SWITCH-GROUP CONTROLLER IN ITS IMPROVED FORM

NEW CHAIR CAR FOR DAYTON AND TROY

The Dayton & Troy Electric Railway has completed the equipping of another fine chair car having three compartments and has placed it in the limited service between Lima and Dayton. One of the old cars heretofore operated in this service has been removed, and a slight excess fare is now charged on all limited cars. It is the intention to equip several more chair cars, so that when the Western Ohio extension from Lima to Findlay is completed next September a limited service will be instituted between Dayton and Toledo, 165 miles.

RESOLUTIONS TO EX-SECRETARY BROCKWAY

On April 21 ex-Secretary Brockway, of the Street Railway Accountants' Association of America, was presented, at his residence in Yonkers, N. Y., with a handsomely engrossed set of resolutions, recently adopted by the executive committee of the association, in recognition of his services to that body. The resolutions were handsomely enclosed in a mahogany frame, and were delivered personally to the recipient by the present secretary, Elmer M. White. They read as follows:

Whereas, W. B. Brockway has held the office of secretary and treasurer of the Street Railway Accountants' Association of America since its organization in 1897, and

Whereas, The formation of this association was due in large part to the suggestion and initiative efforts of Mr. Brockway, and

Whereas, The present highly satisfactory condition of this association is due in a very large degree to his zeal, undivided interest and discriminating judgment, uniformly exhibited in the discharge of his duties as secretary and treasurer of this association, to his activity and success in securing and retaining the interest and support of the street railway fraternity of this country in the work of this association, and to his valuable aid and energetic and capable handling of the work, and

Whereas, He has found it necessary, owing to the pressure of his business, to resign from the office of secretary and treasurer of this association; therefore, be it

Resolved, That the executive committee of the Street Railway Association of America, on behalf of the association, express to W. B. Brockway its appreciation of his skill and knowledge so freely placed at the disposal of the association, and its thanks for his time and energy so unbegrudgingly offered during the years he has acted as its secretary and treasurer.

W. G. Ross, President.
ELMER M. WHITE, Secretary.

The recent purchase of the Hartford, Manchester & Rockville Tramway Company of Connecticut by the Boston & Worcester interests, in connection with the Worcester & Hartford line, points the way toward the ultimate establishment of a high-speed service between Boston and New York. The acquisition of this link is an important addition to the interurban system of the Shaw syndicate, as it constitutes another step in the through communication promised between Boston and Hartford, with but a single change of cars at the outside. The Boston & Worcester interests have only to complete the route to Hartford and acquire or make contracts with the line between Hartford, New Haven and Portchester to be able to run cars from Boston into New York without change.

THE BLOOMINGTON, PONTIAC & JOLIET SINGLE-PHASE ELECTRIC RAILWAY

BY JOHN R. HEWETT

In the Street Railway Journal of March 25 an account was published of the opening of the Bloomington, Pontiac & Joliet Railway, and it is now proposed to enter into a more detailed description of this system. The railway is of special interest, being the first in this country to be opened for public service operated by single-phase current alone.

Fig. 1 shows how this line will ultimately extend from Joliet to Bloomington, a distance of 90 miles. It bids fair to be an important link in a chain of electric railways which, it is anticipated, will connect Chicago with St. Louis. At the present time electric cars are running from Chicago to Joliet. At the other end of the system, St. Louis and Edwardsville are already connected by electric lines, and so are Decatur and Carlinville. With the completion of the Bloomington, Pontiac & Joliet Railway, nearly half the distance between these two great commercial centers will be covered, and but two links will be wanting, viz., those from Bloomington to Decatur, and from Carlinville to Edwardsville. Both these propositions are now under consideration. At the present time the line is completed from Pontiac to Odell, a distance of 10.4 miles, this portion having been opened to public traffic on March 15. The construction is now in progress from Odell to Dwight.

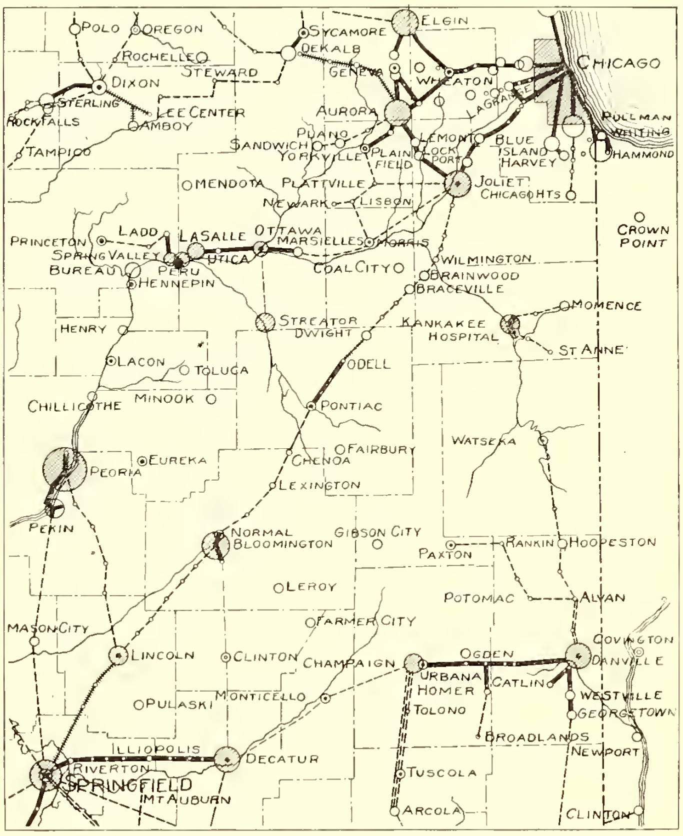


FIG. 1.—MAP SHOWING SYSTEM AND CONNECTIONS OF THE BLOOMINGTON, PONTIAC & JOLIET RAILWAY

The General Electric Company is responsible for the entire electrical equipment of the line, the system employed being in general similar to that used on the Ballston division of the Schenectady Railway Company's lines, and described in the Street Railway Journal for Aug. 27, 1904. At the present time only one car is in operation, but in the near future others will be put into service.

ELECTRICAL EQUIPMENT

The arrangements at the power station are only of a temporary nature at present, but with the extension of the line a new and up-to-date power station will be built. The generator for supplying current to the line is a General Electric three-phase, 25-cycle machine, generating 53 amps. at a pressure of 3300 volts when running at 500 r. p. m. For the excitation of the fields a 12½-kw direct-current machine is belted to the shaft of the main generator, the smaller unit running at 1360 r. p. m. These machines, together with the switchboard, etc., are located in the power plant of the Pontiac Light & Water Company, which is situated on the banks of the Vermilion River.

Current is supplied to the trolley at a pressure of 3300 volts and transformed to lower voltages on the car. The current is collected by a 5½-in. trolley wheel, which, it is interesting to note, has been giving perfect satisfaction at this high voltage.

MOTORS

The cars are furnished with four GEA 605 75-hp motors, designed to work at a pressure of 200 volts. Each motor weighs approximately 4900 lbs. The GEA 604 motor used on the Ballston line, and described in the Journal of Aug. 27, 1904, and the GEA 605 are identical so far as their electrical design is concerned; but there are certain mechanical improvements embodied in the latter type well worthy of note. In this later design the field laminations and windings are self-contained and entirely independent of the motor housing. The housing is split and bolted together, so, should the fields become damaged in any way, it is an easy and inexpensive operation to renew them. Duplicates of these parts can be kept in stock, and as they, together with the armature, represent the only parts of the motor that there is any likelihood of becoming damaged, this facility for renewal is likely to prove a great factor in reducing the cost of maintenance. Figs. 3, 4 and 5 are outline drawings of the 605 motor, and it will be noted from these that easily detached end plates are provided. The assembled field laminations are held rigidly in the housing castings, which is a point of great moment in a railway motor subject to heavy strains and severe vibration. The motors are nose suspended and have a gear ratio of 4.3.

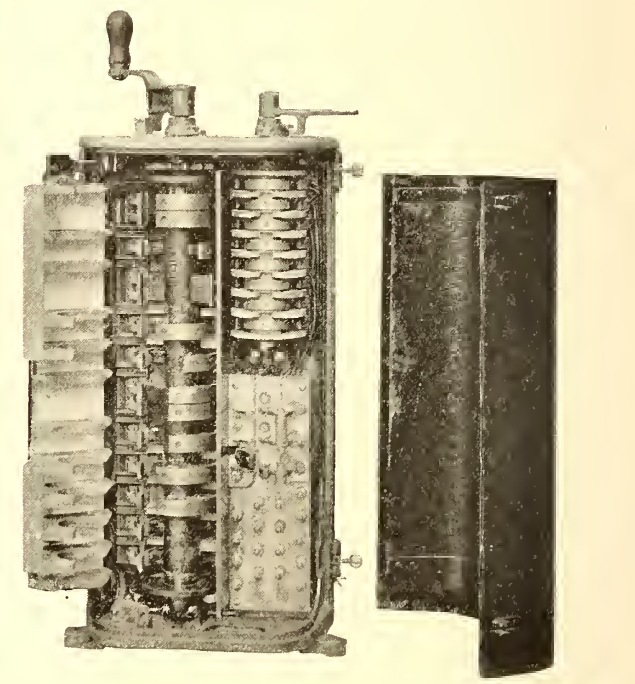
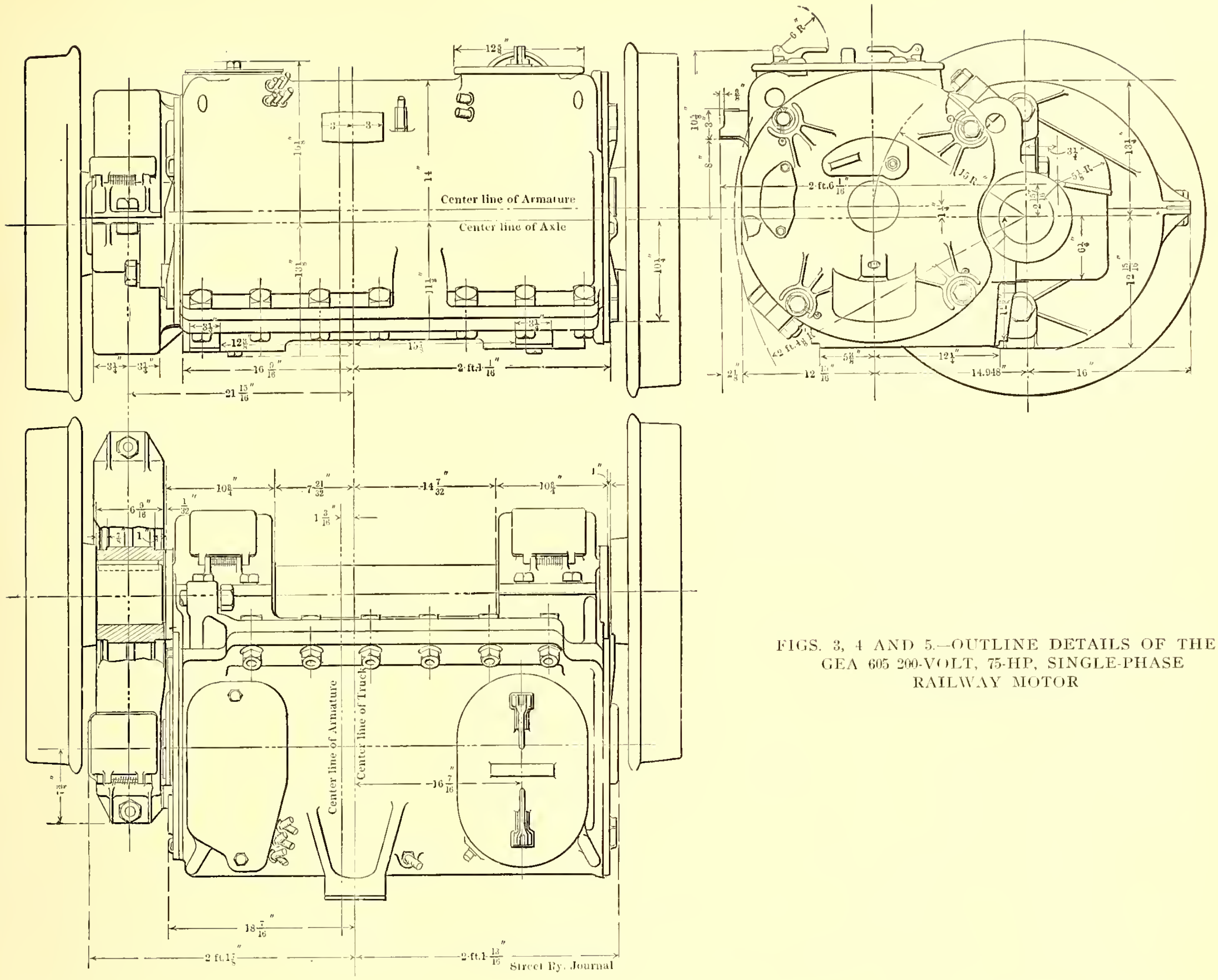


FIG. 2.—TYPE T-33 CYLINDER CONTROLLER WITH CASING REMOVED

CONTROL APPARATUS

The car is equipped with two T-33 cylinder controllers, one of which is illustrated in Fig. 2. The four motors are connected permanently in series with all the fields on the ground side and energized from the low-pressure taps of the com-



FIGS. 3, 4 AND 5.—OUTLINE DETAILS OF THE GEA 605 200-VOLT, 75-HP, SINGLE-PHASE RAILWAY MOTOR

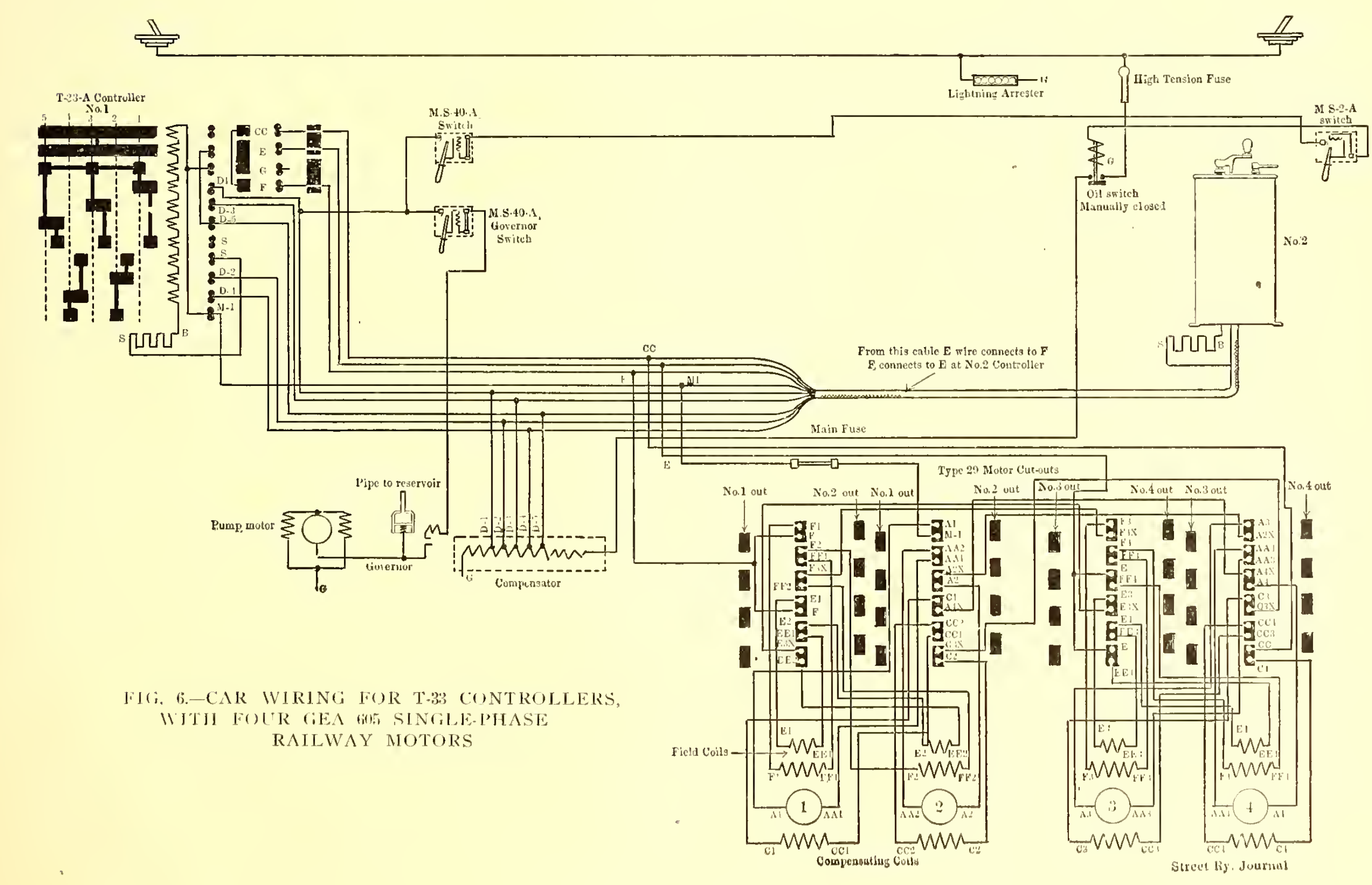


FIG. 6.—CAR WIRING FOR T-33 CONTROLLERS, WITH FOUR GEA 605 SINGLE-PHASE RAILWAY MOTORS

pensator. This compensator has a capacity of 110 kw, is oil-cooled with natural circulation, and provided with five voltage taps, giving pressure of 400 volts, 500 volts, 600 volts, 700 volts and 800 volts. These five taps correspond with the five notches

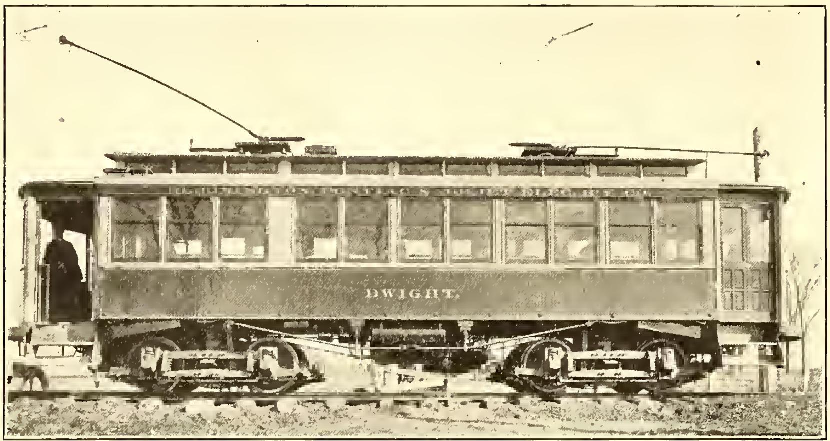


FIG. 7.—COMPLETELY-EQUIPPED CAR FOR SINGLE-PHASE SERVICE ON THE BLOOMINGTON, PONTIAC & JOLIET ELECTRIC RAILWAY

on the controller dial plate, so that each notch constitutes a running point. To avoid the possibility of the motorman leaving the handle between points and burning the fingers by short-circuiting two sections of the compensator, a small section of resistance is interposed during the moment of transition from point to point. Each finger of the controller is provided with a separate blow-out, the coils of which are all in series. These coils are also connected in series with the "transition" resistance just mentioned, so that current flows through them only when the control fingers are passing from point to point, and from the first point to the "off" position. Each pair of motors is provided with a cylindrical cut-out switch operated by the reverse handle of the controller, by means of which any one motor can be cut out. Fig. 6 will give a clearer conception of the wiring and connections than a written description.

It is of considerable interest to note that the headlight is a 25-cycle arc lamp, which is connected in series with the incandescent lamps for illuminating the interior of the car. This headlight is causing no trouble whatever.

Reference to Figs. 7 and 8 will show that there is no crowding of apparatus under the car. The car illustrated is equipped for single-phase operation only, but it is interesting to note that the only additions required for a. c.-d. c. operation are:

One d. c. switch,

One commutating switch,

Five rheostats, each measuring $11\frac{3}{4}$ ins. x $18\frac{1}{2}$ ins. x $13\frac{1}{2}$ ins.

SAFETY DEVICES

The main oil switch, illustrated in Fig. 9, is closed by hand and held in this position by a retaining coil energized from the 400-volt tap of the compensator. A retaining coil switch is situated in each cab and is in series with this circuit, with the result that the main oil switch is thrown by opening either retaining switch. The retaining coil is designed to automatically release and open the oil switch should the voltage drop to half its normal value.

The high-tension circuit is protected by a fuse of the expulsion type, which is mounted on the roof, while the low-voltage circuit is protected by a copper ribbon fuse placed in a magnetic blow-out fuse box. All of the auxiliary circuits are protected by cartridge fuses.

AIR-BRAKE EQUIPMENT

The air-brake equipment is of special interest, as only one motor is employed, which is of the compensated type, to enable the compressor being operated from both a. c. and d. c. trolleys. The two main parts—e. g., the compressor and motor—are constructed separately, and afterward bolted together to form one unit. Both motor and compressor are self-enclosed and as dust-proof as possible.

The motor frame is rectangular in shape. The magnetic circuit is composed of laminated iron, is provided with slots for the retention of the field or stator windings and is bolted to the end castings by four through bolts. The armature is easily removed when these end castings are taken off. The commutator is 6 ins. in diameter. The compressor cylinders are cast side by side in a horizontal position, and with the frame form one casting. The motor and compressor are geared together by means of herring-bone toothed wheels; the gear ratio is 7.17. The pistons are slightly over 6 ins. in diameter, with a stroke of $3\frac{1}{2}$ ins. When the motor is working from a pressure of 320 volts a. c., the pump speed is 164, and with 550 volts d. c., 159, giving an average piston displacement for both a. c. and d. c. operation of over 20 cu. ft. per minute. The weight of the compressor and motor complete is approximately 950 lbs.

THE CAR

The car now in operation, and the one exhibited at the St. Louis Exhibition, which will soon be put into service on the

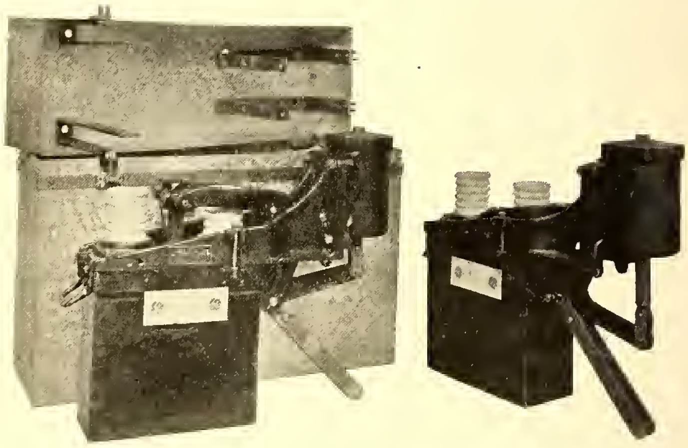


FIG. 9.—300-AMP., 7500-VOLT OIL SWITCH, WITH LOW-VOLTAGE RELEASE

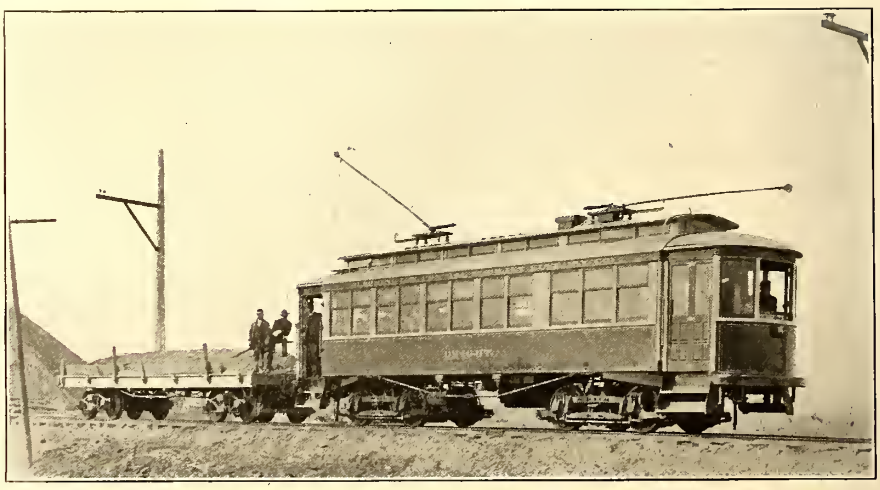


FIG. 8.—MOTOR CAR HAULING A FLAT TRAILER

line, were both manufactured by the American Car Company, of St. Louis. The former is illustrated in Figs. 7 and 8. Its principal dimensions are: Length over all, 41 ft. 8 ins., and with over all, 8 ft. $7\frac{1}{2}$ ins. The car is mounted on two No. 27 E-$1\frac{1}{2}$ Brill trucks, furnished with 34-in. wheels with M. C. B.

standard treads and flanges. The wheel base is 6 ft. The axles are 5½ ins. in diameter and 5¾ ins. at the gear seat.

The interior of the car is handsomely finished in cherry. The seats have high backs and are upholstered with green leather; there are sixteen in the main compartment, while the smoking compartment is provided with seats of the longitudinal type. A hot-water heating apparatus is installed in the smoking compartment, but this can be removed in summer and make room for another seat. The weight of the car complete is approximately 29 tons, and that of the ntire electrical equipment is 5137 lbs.

THE OVERHEAD CONSTRUCTION

The overhead construction is of the simplest possible nature and is of special interest, being in the main similar to the design used by B. J. Arnold in his Lansing experiments. The trolley wire is supported by a catenary construction, both trolley and catenary carrying current. There are two trolley wires running parallel with each other, separated by a distance of 7 ins.; but extra holes are drilled in all the wooden brackets to permit this distance being varied if desired. Both trolleys are of No. 00 grooved copper wire, and the steel catenary consists of a stranded steel cable ⅜ in. in diameter, there being seven strands of No. 11 steel wire. This arrangement of duplicate trolleys not only eliminates all the switching complications, but also obviates the use of extra feeders. At the present time the trolley is supported from the catenary at intervals of every 100 ft. by mechanical clips of malleable iron, made in two parts and provided with hooks which slip over the catenary cable; these hooks are hammered down to prevent the possibility of their becoming loose. It has not yet been decided whether the trolley will ultimately be supported from the catenary at intervals of 100 ft. or 10 ft. There are arguments both for and against

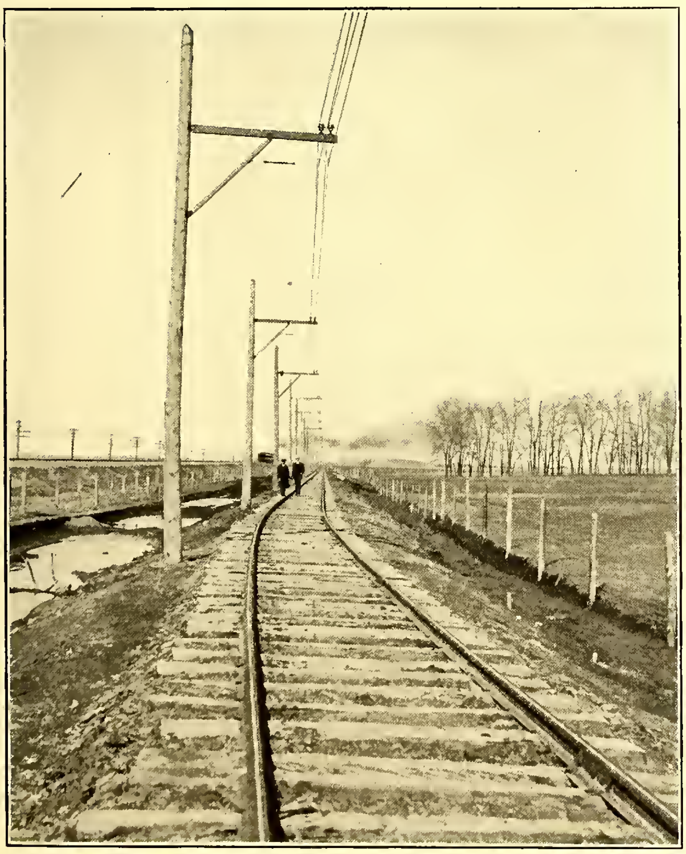


FIG. 10.—ALONG THE LINE OF THE BLOOMINGTON, PONTIAC & JOLIET SINGLE-PHASE RAILWAY

each arrangement. Although the construction is such that little trouble is anticipated from a broken trolley, such contingencies have to be considered. Should a break occur in a trolley supported only at every 100 ft., the broken ends in falling to the ground would be likely to cause a short-circuit sufficient to throw the overload switch in the power house, and the line would then remain dead until the fault was remedied. But, on

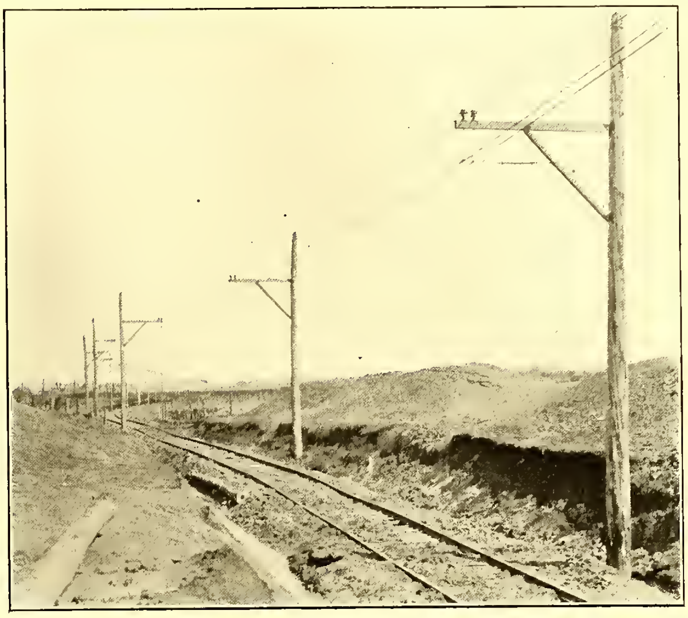


FIG. 11.—VIEW SHOWING CATENARY LINE CONSTRUCTION

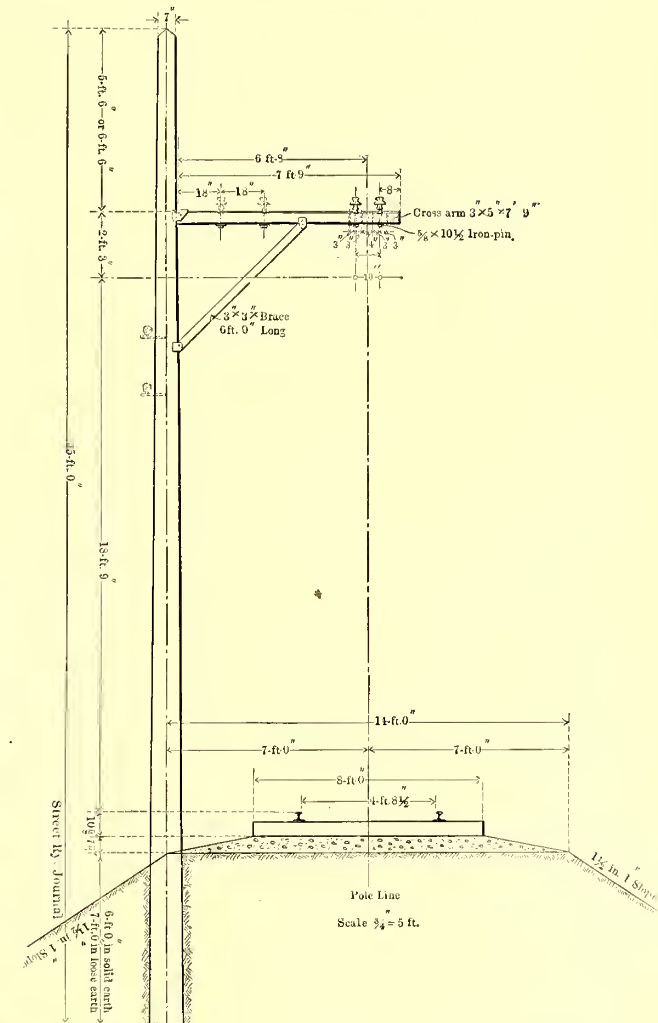


FIG. 12.—DETAILS OF POLE AND BRACKET CONSTRUCTION

the other hand, were the broken trolley supported every 10 ft., the free ends will be more likely to be dangerous to life and property, due to the fact that no short-circuit would occur, and the possibility of anyone on the line forming a short-circuit through their bodies by coming in contact with the hanging wire would be increased. Figs. 10 and 11 give an excellent idea of the pole and bracket construction; in both views the catenary is well illustrated, and Fig. 12 gives further details. The poles are 35 ft. in length, are buried in the ground to a depth of 6 ft. and are 7 ins. in diameter at the top. They are spaced at a distance of 100 ft. apart. The trolley is supported 19 ft. from the ground. For supporting the catenary, 5-W-Thomas high-tension insulators are used, which were subjected to a severe test before shipment. Details of these insulators are given in Fig. 13. They are supported on malleable-iron pins and attached to the same by means of Portland cement. The poles are placed at a distance of 7 ft. from the center of the track. The brackets are of Washington fir, 7 ft. 9 ins. in length, and have a cross section of 3 ins. x 5 ins. They are supported by wooden knee braces with a section of 3 ins. x 3 ins. The brackets and braces are held together, and both are attached to the pole by means of malleable-iron castings of the same pattern as those used by B. J. Arnold on the Lansing Railway. The trolley is anchored every 2000 ft. All strain and guy wires are insulated by means of strain insulators, consisting of impregnated hickory, furnished with malleable-iron heads and eyes. These are 24 ins. in length, and were manufactured by the General Electric Company; they are similar to those in use on the Schenectady-Ballston line.

FIG. 14.—VIEW OF OVERHEAD CONSTRUCTION IN PONTIAC

Fig. 14 is of considerable interest, showing the overhead construction in Pontiac. The hickory strain insulators just referred to are clearly seen, and the still further precautions taken to insure perfect insulation will be noticed at *A*. The poles in Pontiac are of iron.

The present section in operation is, as previously stated, 10.4 miles in length, where no transformer stations are used; but, of course, as a greater length of line is put into operation, these will be imperative. It will be a matter of considerable interest to watch developments in this direction, as the manner of providing for safety devices, switches and attendants at the substations on this type of line will be an important item, and their successful operation may be one of the determining factors in the construction of single-phase railways. The high-tension transmission lines will be a single-phase system at a pressure of 33,000 volts.

THE TRACK

The track is remarkably level, the maximum grade amounting to only 1 per cent, and this only occurs at one point. The line is constructed for only a single track, turn-outs and crossings being provided where necessary. The roadbed is not as yet complete, but when finished is likely to compare well with steam road practice. Fig. 15 shows the cross section of the roadbed for both embankments and excavations. The soil is of a light nature, and the frost only just having gone out of the ground, there are a few bad places at certain points, but these are being repaired as quickly as possible. The ballast consists largely on burnt shale, the company owning a worked-out coal mine from which this is obtained. The rails are of the A. S. C. E. standard cross section and weigh 70 lbs. per yard. They are 33 ft. in length and are bonded with General Electric 8-in. ribbon bonds, which have a capacity equal to No. 0000 copper wire. Cross bonds are used every 1500 ft. There are approximately 2600 ties per mile. These are 6 ins. x 8 ins. x 8 ft. in

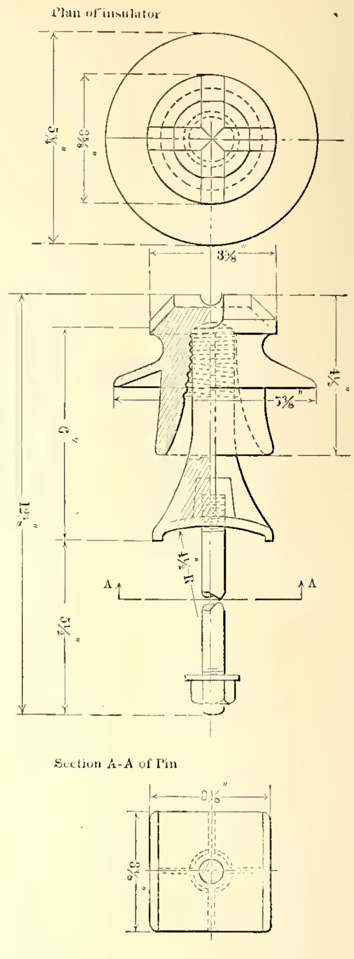


FIG. 13.—PLAN, HALF ELEVATION AND HALF SECTION OF INSULATOR

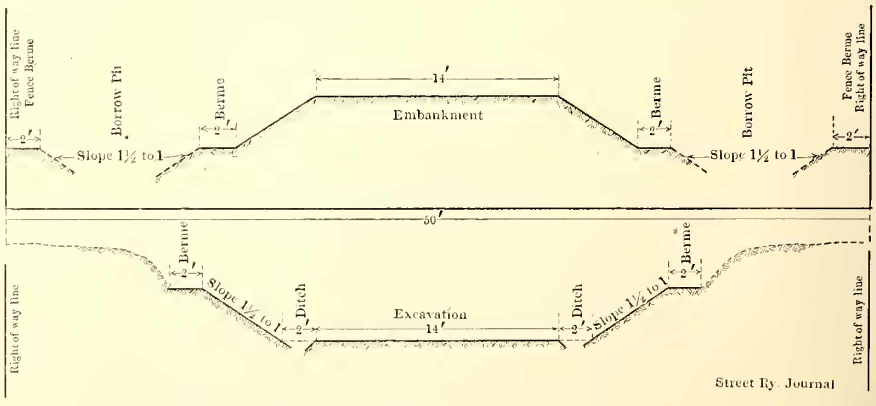


FIG. 15.—DETAIL CROSS-SECTION OF ROADBED

length. But the specifications stipulated that 65 per cent should hold up to 7 ins. Half the road is laid with continuous-joint fish-plates, and the other half is provided with Weber joints.

The foundations for all bridges are constructed of cement and the girder work is of steel. All culverts under 24 ins. are constructed of tile work; those ranging from this figure up to 20 ft. are built of concrete and steel; Fig. 16 illustrates typical bridge on the line.

It is interesting to note that the new electric line is running parallel with the Chicago & Alton Railroad, and that there is a considerable amount of rivalry between the competing companies. The Bloomington, Pontiac & Joliet lines cross the Wabash and Illinois Central tracks about a mile from Pontiac, and, due to the litigation at present proceeding concerning the right of the new company to cross the steam companies' lines, the electric cars are unable to run into Pontiac itself, but since writing the present article the writer has learned that these differences have been settled by the Illinois State Railway and Warehouse Commission. The Wabash tracks are to be raised 4 ft. and the electric line to cross underneath. The executive of the new road has shown considerable enterprise in not letting these hindrances deter the opening of the line, and free 'buses are being run from Pontiac to the present terminus.

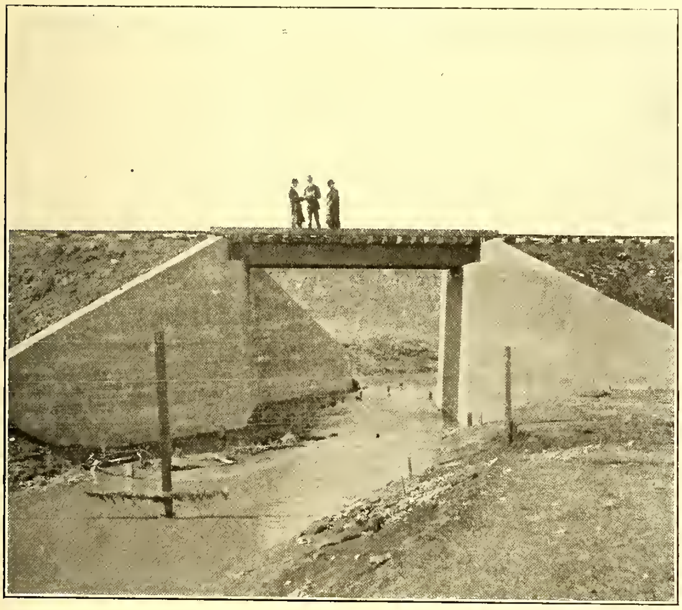


FIG. 16.—VIEW OF CONCRETE CULVERT ALONG THE LINE OF THE BLOOMINGTON, PONTIAC & JOLIET SINGLE-PHASE RAILWAY

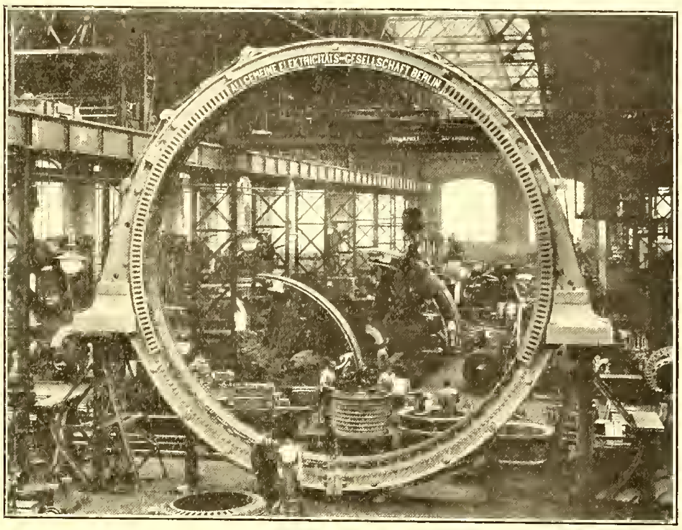
Already an active business is being carried on, and the first day that the line was opened—Wednesday, March 15—over 100 passengers were carried, and the average number for the next ten days amounted to over 200 passengers per day. On March 25, 323 passengers, and the 26th, 551 were carried. The railway company has no car house at present, and it certainly speaks well for the one equipment running that it has been in continuous operation and done the entire work of the line since the opening.

The acceleration is remarkably good for single-phase operation and compares most favorably with other similar equipment. Of course, as good results in this direction cannot be expected as with the d. c. motor, but the results at Pontiac have certainly astonished many.

The Arnold Company acted as consulting engineers for the system, and the writer wishes to acknowledge his thanks to Mr. Damon, of that company, for his courtesy in giving information, and also to Fred L. Lucas, the general manager of the Bloomington, Pontiac & Joliet Railway, for affording him every assistance in preparing the present article.

NEW POWER STATION AT MANCHESTER, ENGLAND

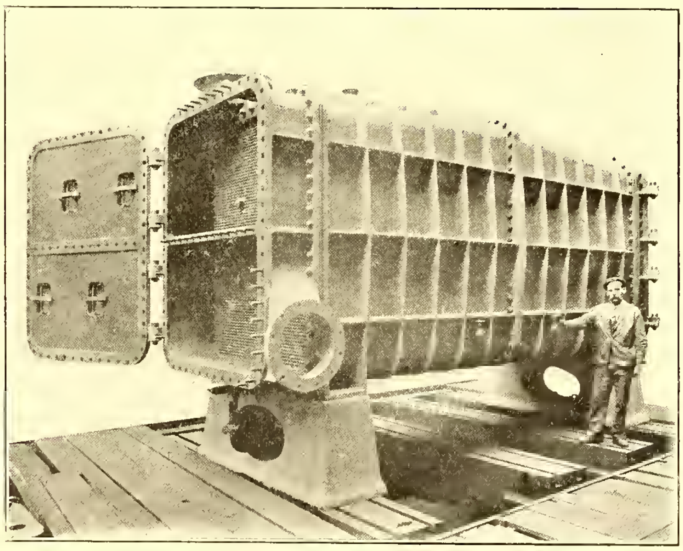
In the issue of this paper for Sept. 6, 1902, a preliminary plan was published of the new power station which the Manchester Corporation of Manchester, England, had recently commenced to erect adjoining its Stuart Street plant. This station is designed for an ultimate capacity of 70,000 hp, and the work has been carried on under the supervision of G. F. Metzger, chief engineer of the city. Two units of 3750-kw each are now in place and the current is used for both traction and lighting



RING OF 3750-KW GENERATOR, MANCHESTER

purposes. In the accompanying plan the outlines of the proposed station are shown, as are also those of the early adjoining station.

The engines were supplied by the Wallsend Slipway & Engineering Company, Ltd., and are of the vertical triple-expansion



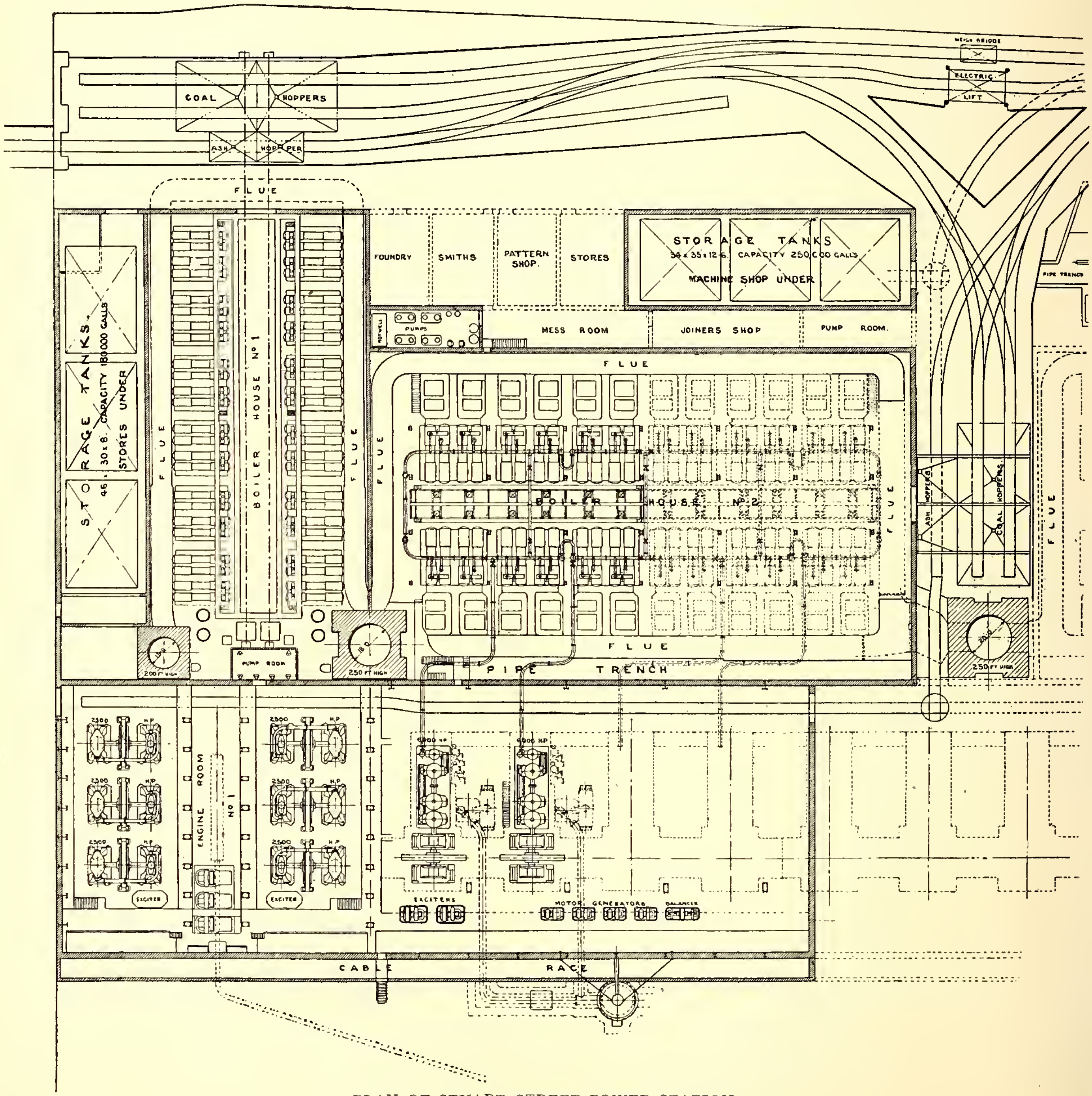
SURFACE CONDENSER

type, having one 39-in. high-pressure, one 68-in. intermediate-pressure and two 72-in. low-pressure cylinders, 60-in. stroke, and four cranks. They are designed to run at 75 r. p. m. with 190 lbs. per square inch steam pressure at the stop valve, superheated up to 500 degs. F. On emergency load they indicate 6500 hp, and when running non-condensing a maximum of 5000 hp is guaranteed. An efficiency of 91 per cent, and a steam consumption of not more than 11 lbs. per ihp-hour, with a 27-in. vacuum and superheated steam of 500 degs. F. when working condensing, or 18 lbs. per ihp-hour when working non-condensing, were specified, and also an oil consumption, after either engine had been running on the load for six months, of not more than 2 gals. of cylinder oil, or the same quantity of other lubricating oils, per 10,000 kw-hours.

Two surface condensers, one for each engine, are used, and with the hot-well and exhaust-oil separator, were supplied by Mather & Platt, Ltd. The condensers are of the horizontal square pattern, the body being constructed of cast iron, strongly ribbed, and in two halves, bolted together vertically. The length of each condenser is 18 ft.; height, 11 ft., and width, 6 ft. 9 ins., and it is capable of dealing with 72,000 lbs. of exhaust steam per hour. The cooling surface is 11,000 sq. ft., and is effected by 3750 ¾-in. outside diameter brass tubes, tinned inside and out. The exhaust steam passes, before entering the condenser, through an oil separator. The outside dimensions of each separator are 9 ft. x 12 ft., and each is capable of dealing with 95,000 lbs. of exhaust steam and extracting 95 per cent of the oil. In addition, there are two feed-water filters in the pump house, which are intended to remove the remaining small percentage of oil in the feed-water.

Two feed-water heaters are used. They are of the vertical pattern, and each is capable of dealing with the whole of the feed-water required for 13,000 hp. The heating surface of each apparatus is 606 sq. ft., the 132 1½-in. tubes being of brass, 12 ft. long, seamless drawn, and tinned inside and outside.

The current is generated by two three-phase alternators which were manufactured by the Allgemeine Elektricitäts Gesellschaft, of Berlin, and were supplied by the Electrical Company, of London. They are each capable of delivering, at any voltage, between 6300 volts and 6600 volts, 3750 kw to the external circuit, when working at 50 cycles per second on an inductive load, with a power factor of .87; or 4250 kw when working on a non-inductive load with a unity power factor as an ordinary continuous load, and 4900 kw for half an hour as an emergency load. As shown in the illustration, the frames are bolted up instead of being cast solid, a somewhat novel type of construction, and designed largely to facilitate transportation. The generators have efficiencies as follows:



PLAN OF STUART STREET POWER STATION

Efficiency excl. friction	Full load	¾	½	¼
Power factor 1	96%	95%	94%	89%
Power factor .8	95%	94%	92%	86%

The alternators are excited either from Willans Electrical Company's sets erected in the first portion of the Stuart Street works, or from separate motor-generator sets as 200-225 volts.

Current is distributed directly from the power station to the mains of the Manchester Corporation, but in connection with the new station, ten sub-stations have been installed, supplied with thirty-six 150-kw motor-generator sets. These motor-generator sets supply current for lighting purposes at from 400 volts to 450 volts on the five-wire system, and for traction purposes at 500 volts to 550 volts.

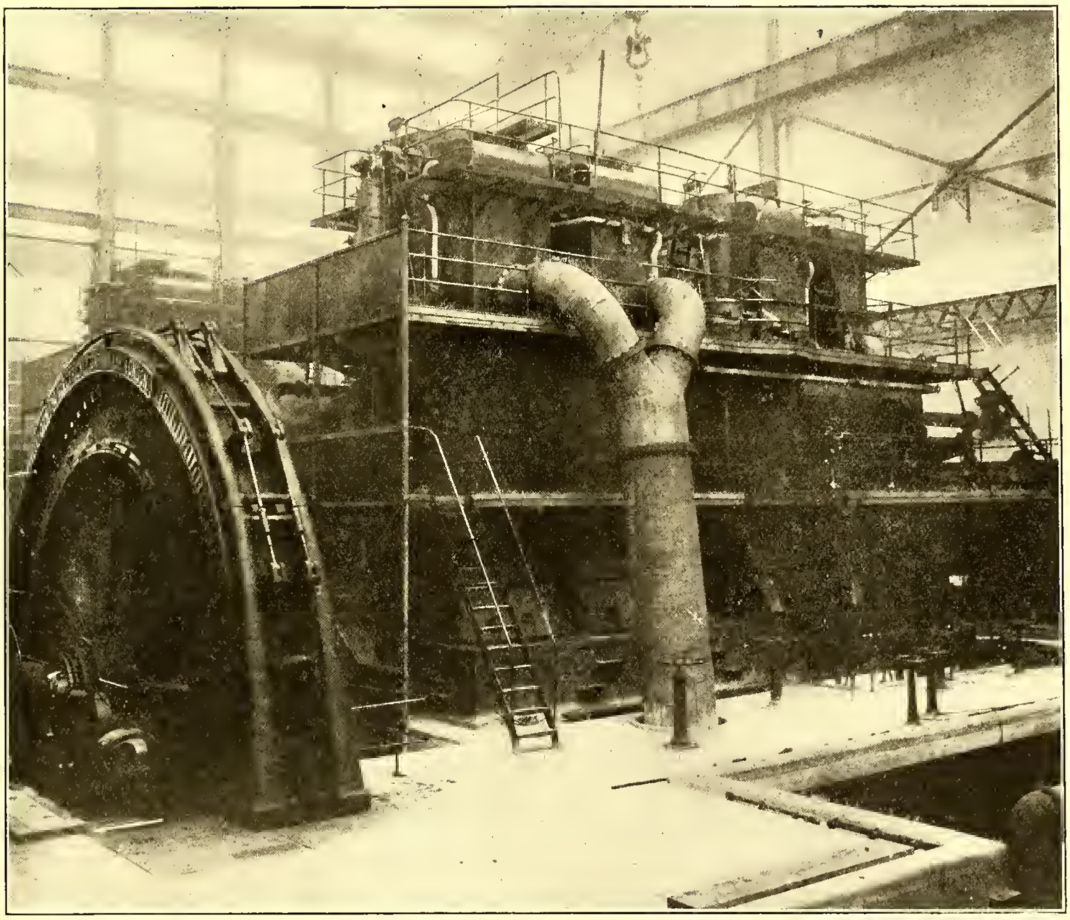
The boiler room is equipped with twelve boilers of the Babcock & Wilcox make. Each has 5730 sq. ft. of heating surface, and contains twenty sections of straight 4-in. tubes, each section containing thirteen tubes 18 ft. long. These tubes are connected to wrought-iron headers attached to two 4-ft. 6-in. steam water drums, 23 ft. 7½ ins. long, and built up with 11-16-in. steel plates. Each boiler is also fitted with a Babcock & Wilcox superheater of 509 sq. ft. heating surface, and consisting of 1½-in. solid drawn steel tubes, through which a temperature of 650 degs. F. is attained. Each boiler also has a Babcock & Wilcox chain grate mechanical stoker. Two coal conveyors are used, one on each side of the boiler house, and each is capable of handling 40 tons of coal per hour. They are of the Babcock & Wilcox manufacture, and of the bucket type, the buckets being suspended from an endless chain and arranged so that they can discharge the coal automatically into the bunkers at any point required.

Green economizers are used, containing 2880 tubes with a total heating surface of 36,000 sq. ft. They are erected in pairs, directly behind each range of boilers, and are constructed for a working pressure of 200 lbs. per square inch. Blake & Knowles feed-pumps are used, together with six cooling towers, three of which were supplied by the Wheeler Condenser Company and three by Messrs. Balcke, of Germany.

The high and low-tension feeder installation, as well as the supply of telephone and potential wires and arc light cables, which are carried in the conduits, was entrusted to W. T. Glover & Company. The 6500-volt feeders are clipped on to brackets, spaced every 6 ft. apart, while the other cables rest on porcelain insulators, fitting loosely on the brackets. In the majority of cases each sub-station has two feeders direct from the Stuart Street works, one being intended as a spare, or to allow the current for lighting and traction to be supplied by separate cables. In some cases of the outlying districts, however, the same feeders are looped into a sub-station and out again to the next one.

The cost of the entire equipment described, exclusive of the buildings, was as follows:

	Contract price	Per electrical horse-power
Engines, alternators and motor generators	£112,740	$56.37
Boilers	24,750	12.37
Economizers	5,514	2.75
Feed pumps	1,557	.76
Surface condensers	6,300	3.15
Switch gear	29,086	14.54
Cooling towers	9,442	4.72
Feed-water heaters	701	.35
Fifty-ton cranes	4,455	2.23
Piping	10,057	5.03
Coal conveyors	5,562	2.78
Cables	130,800	65.40
Feeder and section pillars	10,382	5.19
Total	£351,346	$175.67



3750-KW UNIT, MANCHESTER

Eighty miles of extra high-tension feeders have been laid, each feeder being three-core, each core consisting of 37/15 stranded copper conductor and paper insulated. Each core has a radial thickness of 175 mm of paper, and after the three cores were laid up together they were insulated with a further 175 mm of paper, making a total of 350 mm between conductor and conductor and lead. The lead sheathing over the paper is ⅛ in. thick, and over this there is an armoring of 100 mm galvanized steel wires, making the total over all diameter of each cable 2¾ ins. The low-tension cables are 70 miles in length and are also paper insulated.

The physical standard of the employees of the Columbus, London & Springfield Railway Company is high. The twelve motormen are large, good looking, active, competent men, who weigh as follows: 300, 260, 250, 240, 240, 215, 204, 201, 200, 197, 195, 180 lbs. The superintendent weighs 245 lbs. This makes the average more than 225 lbs. which would appear to be the record.

ELECTRICITY VS. STEAM FOR HEAVY HAULAGE

BY A. H. ARMSTRONG

It is interesting to look back fifty years and note the progress that has been made in the development of the steam locomotive. The motive power departments of our large railroads and the locomotive manufacturers have responded to the demand for increasing transportation facilities and have brought the steam locomotive to a degree of perfection which is marvelous, considering the restrictions of weight and space. The improvements made in roadbed, stronger bridges and heavier rails have rendered it possible to operate locomotives weighing over 200,000 lbs. on the drivers and capable of indicating upward of 2000 hp for short periods. The operating conditions, however, seem to call for greater outputs than attained thus far, and it is pertinent to inquire into some of the limitations of steam locomotive construction in order to find out how far we can expect future designs to fulfil the constantly increasing requirements. The restrictions imposed by 4-ft. 8½-in. gage and the limitations in weight per axle placed by rails and bridges make it possible to roughly outline the dimensions of any locomotive and approximate the power developed with our present method of burning coal for steam generation.

The inquiry into the limitations of the steam locomotive are especially timely, owing to the entrance of the electric locomotive into the field of heavy traction. The opinion has existed that the field of the electric motor properly lies in the propulsion of the single cars or small trains of our city streets, or our suburban lines. Electric motors for railway work, however, have been built of several hundred horse-power and have been eminently successful, which, together with the fact that an electric locomotive is made of an aggregation of such motors distributed over the several axles, opens up possibilities which may call for a readjustment of preconceived ideas of heavy freight haulage.

Whenever the electrical engineer is afforded the opportunity of investigating the possibility of replacing steam locomotives by electric locomotives upon a given section of line, he is generally confronted with some general figures of operating expenses drawn up along the following approximate lines:

AVERAGE OPERATING EXPENSES, STEAM LOCOMOTIVES

	Per Cent of Total
Maintenance of way and structures	20.0
Maintenance of locomotives	10.0
Maintenance of passenger and freight cars, shops, etc.	20.0
Engineer and roundhouse men	10.0
Fuel for locomotive	10.0
Oil, waste and locomotive supplies	1.5
Taxes and general expenses	10.0
Incidental expenses	18.5
Total	100.0

The engineer is further informed that the total cost of operation per train-mile may be, say, $1.10, the several detailed expenses being proportioned as per above table. After vainly struggling to make a favorable showing for electricity for the section of road it is proposed to equip, this section being invariably the most expensive section of the road to operate, it dawns upon the engineer that he has been given general expenses for the whole division, which do not apply in any degree to the actual expense of operating the section given him for his consideration. It is very seldom that the steam road operator is acquainted with the details of operating expenses upon every single section of his road, and the only data he has available are culled from the general operating expenses, which seem to be made up with the end in view of mystifying the electrical engineer who is called upon to inquire into their method of compilation. As illustrating this point, the data for a certain section of one of our Western roads containing an average grade of nearly 2 per cent for 20 miles were offered to the writer for his consideration of the possibility of installing electric locomotives in place of the present steam locomotives, which were known to be very expensive to operate. The usual general expenses for the entire division were submitted with the engineering details, but a careful investigation of the actual operating costs showed the following to hold true for the grade section itself:

AVERAGE AND ACTUAL COST PER LOCOMOTIVE-MILE

	Actual Cost	From Division Expenses
Fuel	65.7 Cents.	11.0 Cents.
Labor	10.53 "	11.0 "
Oil and waste	.31 "	1.6 "
Maintenance and repairs	11.8 "	11.0 "
Total	88.34 "	34.6 "

The above expenses include no general expenses, no maintenance of way, or conducting expenses beyond the engine and round-house crews. It is noted that the fuel expenses formed nearly 75 per cent of the total expense of operation, and constitutes an item worthy of much more careful consideration than is the case for the average of the entire division. The locomotives were of the heavy consolidated type, weighing 178,000 lbs. on the drivers, and with tender having total weight of 318,000 lbs. The expenses given above are for helper service only, and from the size of locomotive used it is evident that the service was of the severest character.

The service upon this particular grade required the operation of two locomotives, whose duty consisted in acting as helpers to the four or five trains per day operating over this section. During the greater part of the twenty-four hours, the locomotive was standing idle, or drifting down grade; in either case, doing no useful work, but at all times under steam, ready for instant commission. The effect upon the coal consumption is shown above in the operating expenses, and is further illustrated by a series of tests, lasting over several weeks, from which it was possible to determine the useful work done by each locomotive during the month. Instead of the 5 lbs. or 6 lbs. of coal per hp-hour, we might be led to expect there was actually consumed 10.8 lbs. of coal per hp-hour of useful work done. By "useful work" is meant the pro rata share of the locomotives when acting as helpers up grade. Indicator cards taken showed that locomotives were working from 0.6 stroke to full stroke, so that while the locomotives were performing useful work they were burning coal at the maximum rate and using the steam very inefficiently. This example is cited as an instance where electric locomotives could reduce the excessive fuel consumption, costing, by the way, $4 per ton, and effect a saving sufficiently great to pay a handsome return on the investment.

The designers of steam locomotives seem to be at variance as regards the proportion of grate and heating surface to be employed, whether the increased economy, if any, of the compound locomotive justifies its increased cost of repairs, and lack agreement upon a number of details of construction of minor importance. There are, however, certain limiting values of coal consumption, water evaporation and haulage capacity upon which authorities agree in general and which may be taken as roughly outlining the capacity of the steam locomotive of to-day, with little promise of considerable increase in the future, so long as present methods of burning fuel are adhered to. It is in the direction of defining the capacity of the steam locomotive that we must pay tribute to the excellent series of articles being published by G. R. Henderson, and many of his results will be used in the present article as offering in readable form the various relations of steam and fuel consumption to haulage capacity.

The following constants have been chosen as being typical of a steam locomotive designed for heavy freight haulage:

Diameter of cylinders	21 ins.
Stroke of pistons	32 ins.
Diameter of drivers	56 ins.
Boiler pressure	200 lbs.
Grate area	40 sq. ft.
Heating surface	3200 sq. ft.
Ratio heating surface to grate surface	80
Weight on drivers	180,000 lbs.
Total weight with tender	300,000 lbs.
Ratio weight on drivers to total weight	60 per cent.
Tractive effort	40,000 lbs.
Coefficient of traction	22.2 per cent

With such a locomotive it is possible to evaporate 40,000 lbs. of water from 70 degs. F. to a boiler pressure of 200 lbs. This represents the maximum water than can be evaporated for a short time, and this rate could not be sustained for the several hours required to climb the extended grades of our Western mountain roads. Compared with the electric locomotive, this boiler capacity is very similar to the commutator capacity of the electric motors, for instance, a given locomotive could commutate 4800 amps. in four motors without injurious results, and this current capacity of the locomotive may be looked upon as limiting its maximum capacity to do work very much in the same light as the boiler capacity limits the available output of the steam locomotive.

Referring again to our typical steam locomotive, we find it possible with full stroke to reach a speed of 10 m.p.h., or 60 r. p. m., without exceeding the 40,000 lbs. of water which the boiler can evaporate. This speed of 10 m.p.h., therefore, is the maximum speed at which the typical locomotive can deliver the tractive effort corresponding to the slipping point of the wheels. Any increase in speed beyond this point must be accompanied by a shorter cut-off, giving a reduced mean effective pressure and reduced tractive effort. As bringing out this point more clearly, the typical locomotive would be able to haul a trailing load of 1390 tons on a 1 per cent grade with 5 lbs. per ton friction at a speed of 10 m.p.h., but would be able to haul but 850 tons trailing load at 20 m.p.h. up the same grade. In other words, the steaming capacity of the boiler limits the locomotive output at the rim of its drivers to about 1400 hp as a maximum. Furthermore, this output is obtained only by burning 8000 lbs. of coal per hour, and with the further assumption that coal can be consumed indefinitely at the rate of 200 lbs. per square foot of grate surface. These assumptions might be reached in a laboratory test of short duration with the boiler in first-class condition and all conditions favorable, but cannot be considered as fairly representing operating conditions upon our railroads. For the purpose of this article, however—that is, illustrating the maximum output that can be expected from a steam locomotive of the above dimensions—it may be assumed possible to reach the theoretical figures in practical operation.

The interesting series of tests being made upon the electric locomotive designed for the New York Central terminal work throws some light on what can be expected of electric locomotives when handling heavy trains. It is reasonable to expect that an electric locomotive containing no steam generating apparatus, but limited to a suitable support for the motive power only, can greatly exceed the possible output of a steam locomotive containing a complete water evaporating plant in addition to its motive power. Furthermore, the electric locomotive being connected by a sliding contact with practically an unlimited source of power, the designer is concerned only with so constructing its motive power that it shall sustain the strains imposed when performing its function of converting electric into mechanical power. Although designed for a specific purpose, consisting of the rapid handling of passenger trains over a 40-mile section of track with several possible intermediate stops, the New York Central electric locomotive indicates a capacity for doing work far in excess of the heavy freight locomotive cited above as typical of the heavy steam locomotive class. In order to bring out the comparison of these two types of motive power, their relation has been expressed in terms of miles per hour and horse-power output in the accompanying diagram. Both curves show the limits imposed by slippage of the wheels at low speeds, the output of the steam locomotive being somewhat greater up to 12 m.p.h., as it has 180,000 lbs. on the drivers as compared with 136,000 lbs. for the electric locomotive. While the steam locomotive is compelled to reduce this 40,000-lb. tractive effort beyond a speed of 10 m.p.h., owing to boiler limitations, with consequent flattening out of the horse-power curve, the electric locomotive can maintain

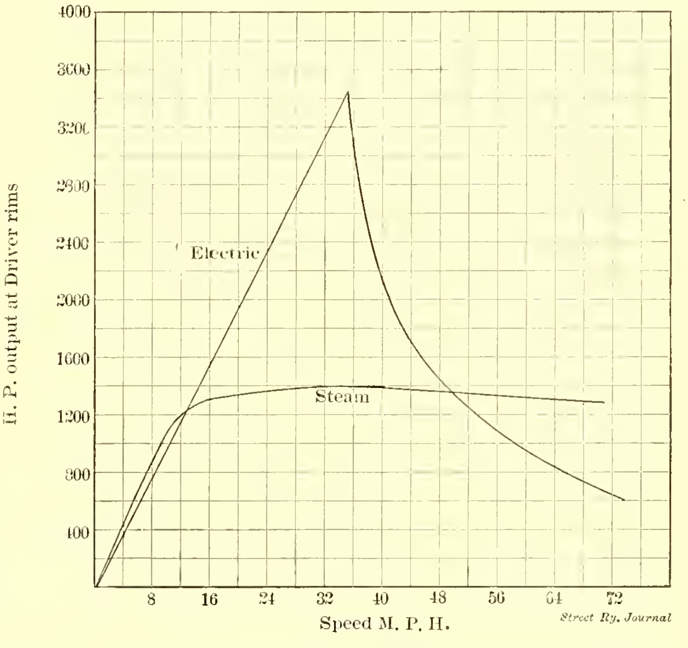


FIG. 1.—COMPARATIVE HP OUTPUT OF STEAM AND ELECTRIC LOCOMOTIVES

its maximum tractive effort of 36,000 lbs. up to 35 m.p.h., beyond which speed the tractive effort falls off rapidly, due to decrease in current, giving rise to the peculiar wedge-shaped curve shown. The steam locomotive up to 10 m.p.h. is working at a coefficient of traction of 22.2 per cent, while the electric locomotive output is based upon 27 per cent coefficient, an increase of 21½ per cent, which is a conservative estimate of the benefits secured by a perfectly uniform turning motion as compared with the pulsating torque imparted by the cylinders of the steam locomotive.

The diagram is worthy of very careful study as indicating possibilities in heavy haulage work not open to the steam locomotive with its restricted output. As an example of the comparative ability of the steam and electric locomotives to do work, the following data has been compiled:

HAULAGE CAPACITY AT VARIOUS SPEEDS

Miles Per Hour	Steam Tons	Electric Tons
10	1,450	1,380
15	1,140	1,380
20	850	1,380
25	650	1,380
30	530	1,380
35	430	1,380
40	360	620

The steam locomotive capable of hauling a 1450-ton trailing load on a 1 per cent grade up to a speed of 10 m.p.h. is forced by its limited boiler capacity to continually reduce the trailing load with increase in speed until at 35 m.p.h. it is capable of hauling but 430 tons behind the tender. Contrast this with the ability of the electric locomotive to haul 1380 tons trailing up to a speed of 35 m.p.h., beyond which speed the permissible load falls off sharply. What possibilities are thus opened for an increase in the tonnage capacity on heavy grades, which are generally single track and where the congestion of traffic is often severe, owing to the limitations of the steam locomotive. The above table is constructed with trailing loads in each case, the weight of the locomotive and tender, if used, being deducted, the electric locomotive being but two-thirds the weight of the combined steam locomotive and tender. The New York Central locomotive is, of course, not designed for heavy freight haulage and could not deliver the outputs given in the curve in Fig. 1 for any great length of time without overheating. It is cited merely as showing the possibility which the electric locomotive offers of concentrating a great horse-power capacity without the necessity of increasing the weight on drivers, as would be the case in steam locomotive construction.

Too much stress has been laid by many electrical engineers upon the economies which can possibly be effected in the coal pile, or in the maintenance of apparatus by replacing the steam locomotive by an electric locomotive. Such economies will undoubtedly be effected in many cases of sufficient amount to afford a handsome return upon the cost of electrically equipping, figuring upon the same methods of operation as are in vogue with the steam locomotives. The electric locomotive, however, offers a means of effecting economies of a much more comprehensive nature than a mere reduction in the expenses for fuel and the possible doing away with the firemen. It becomes possible to concentrate upon an electric locomotive an amount of power out of reach of the steam locomotive designer, and this, too, without exceeding any of the limitations imposed by wheel base, or weights per axle found obligatory in any locomotive design. Instead of limiting speeds of freight trains to 10 m.p.h., and often less, upon the heavy grade sections of our main trunk lines, the electric locomotive offers the possibility of operating trains at speeds limited only by the alignment of the road and the necessity of the time-table. Instead of taking ten hours to climb an 80-mile grade, the electric locomotive can be designed to haul the same train in half the time, thus vastly increasing the tonnage capacity of such a single-track section.

Many millions of dollars have been spent on our steam roads and many millions more are contemplated for the purpose of reducing the ruling grades on mountain sections. The electric locomotive offers the possibility of making the ruling gradient of secondary importance. Inasmuch as its motive power consists of subdivided units distributed over the several axles, it is possible to construct an electric locomotive which shall consist of as many driving axles as the requirements demand. A locomotive consisting of six or eight driving axles, each of which may be equipped with a motor of 400-hp or 500-hp, permits the adoption of a capacity of locomotive capable of developing any torque at any speed called for by service conditions. The capacity of the electric locomotive to do work is limited only by the ability of the draw-heads to withstand the draw-bar pull developed, and inasmuch as the draw-bar pull is practically independent of the speed on the grade, a congested section will be greatly benefited by the higher speed of the electric locomotive on heavy grades.

The steam locomotive when used as a helper on long, severe grades is a very inefficient and costly piece of apparatus to operate and maintain. Under favorable conditions and with very intelligent handling, it can give good economy when operating up grade at a reasonable percentage of its maximum output, but its consumption of fuel and expense in operating does not cease with the completion of the useful work which it has performed in pushing its pro rata share of the train up grade. During the long coast down grade and during the time which the locomotive is standing idle waiting for active commission, there is a constant consumption of coal and waste of steam going on, which contrasts unfavorably with the possible economies of the electric system. The electric locomotive consumes no power going down grade or standing idle, and may even be constructed to return energy to the line when bringing the train down grade, a benefit worth securing not so much on account of the resulting economy in power as of the safety which it insures in bringing the train safely to the foot of a long grade without excessive wear of the brake-shoes and liability to accident resulting from breakage thereof.

The question of water supply for steam locomotives, in itself a small item, may lead to serious complications, as nature does not always place the heaviest grades within easy distance of a pure water supply. The cost of the water itself is small compared with the deterioration it may effect on the boiler tubes, with resulting decreased steaming capacity. It is also impossible to train a large number of locomotive firemen to the degree of perfection attained by automatic stokers in a stationary steam generating station, and the lavish use of coal for our steam roads will in the near future assume an importance which will call for the use of drastic methods, or preferably, the adoption of a more efficient method of liberating and transmitting the energy contained in the coal.

While the wholesale retirement of the steam locomotive in favor of its electric competitor is a dream of the far distant future, there are many isolated sections of steam roads in the operation of which the electric locomotive could effect economies which would well pay for its adoption. These economies may be in the direction of a reduced fuel, labor and maintenance account, but may be much more far-reaching and warrant changes in the present method of operating by steam locomotives. The millions of dollars contemplated for reducing the ruling gradients and double tracking certain sections of single-track roads, in order to increase their capacity with steam locomotive, might be spent with promise of greater return if used for installing electrical equipment.

The different improvements being effected in steam engines are more or less of a detailed nature, this holding true equally of the motive power and the boiler. The use of oil as a fuel instead of coal is perhaps the greatest improvement tending to increase the capacity of the locomotive, and certain roads traversing the oil fields are able to avail themselves of this cheaper fuel. The coal-burning locomotive is, however, the type of apparatus with which the electric locomotive has to compete, and the ability of the latter to concentrate over double the horse-power with same weight upon drivers gives it fundamental advantages of greater import than the detailed improvements of the present steam locomotive.

There is no doubt that if our railroad operators could be made to appreciate the possibilities opened up with the development of the heavy electric locomotive there would be a much more searching inquiry into the actual cost of operating certain sections of our roads with steam locomotives and the question raised as to the economy of their retention for the work they are now doing.

On Sunday, April 23, the Brooklyn Rapid Transit Company carried 1,500,000 passengers. Between 65,000 and 70,000 of these went to Coney Island. On Saturday the company transported over its different routes, including all the pleasure resorts, 1,500,000 people. Both of these were the largest April days in the history of the company.

To accommodate its growing patronage, the Boston & Worcester Street Railway Company will run cars daily between Boston and Worcester, beginning May 15, on a fifteen-minute schedule. That is the schedule now used on Sundays and holidays.

AUTOMATIC SIGNAL AND SAFETY SYSTEMS AS APPLIED TO ELECTRIC RAILWAYS

BY EDWARD TAYLOR

It is with some diffidence that the writer of this article takes up the subject of signal and safety appliances at this time, when all technical literature on this subject is lauding the recent achievements of large manufacturing companies in this line. So much is being said in praise of recent undertakings that a slight criticism or question as to the general practical utility of certain features seems to strike a discordant note. But nevertheless, having had special facilities for investigating the particular advantages and disadvantages of several systems, the writer has formed strong opinions in regard to certain features of this line of work, and feels that the subject can be discussed to advantage from the point of view of an electric railway man. By far the greater part of the literature in this regard has been written by the manufacturing companies, or by their engineers who have achieved success on a project of this character. Being entirely absorbed by the local conditions and requirements, they have treated the subject from a comparatively narrow view point, and its discussion on a broader and more general plane should be of interest to the readers of the Journal.

Having never been connected with any signal company, and being under no obligations to any such firms, makes it possible for the writer to speak from an entirely disinterested standpoint, and though this article will deal chiefly with the weak points of the signal systems, any strictures or derogatory references that may be made are not brought out by a spirit of disparagement or caviling. Indeed, the radical departure from the old methods and the rapid development and advance of the art are most commendable, while the skill and ingenuity with which the several results are obtained is worthy of the highest praise. But, nevertheless, there is still room for improvement in many ways on the present protective systems, and it can do no harm to occasionally bring out these points for the benefit of all concerned.

For two reasons, the old method of spacing trains by means of a time interval is gradually being done away with. In the first place it has been found that this system does not permit of the maximum number of trains being operated over a given line; and in the second, that no particular protection is afforded, as a fast moving train leaving the specified length of time behind a slow one is constantly narrowing the gap between them and must sooner or later overtake it. Block signaling, on the other hand, besides offering protection from collision, affords an excellent means for properly spacing trains, preventing any particular part of the road from becoming congested, and it is still an open question whether trains on a block signal line, even when spaced at considerable distances, will not get over a given section of line faster than would be possible when operating on a time interval. For this reason the matter of spacing blocks, and especially of overlapping, is an important phase of the question when considering the details of installing a signal and safety system, and overlapping should always be regarded as a necessity. Theoretically, the spacing of blocks and the length of the overlap should depend upon the traffic, the profile of the road, etc., but in reality it will be found in most cases that the matter resolves itself into a financial question, or that the number of blocks per mile is limited by the cost of the individual sets of apparatus. It is indeed difficult to reconcile the needs of the most efficient protection on electric railways with a low initial cost. Up to the present time, on the majority of electric railways on which the traffic is so heavy that safety and signal devices are necessary, the headway is so short as to make lengthy overlapping prohibitive, while on the other hand, short blocking and overlapping necessitates a greater number of sets of apparatus being installed, which, of course, adds greatly to the expense. In one point, however, the electric road is at an advantage. Owing to the frequent stops and the necessarily limited speed of its trains, the making of the distance signal a caution in connection with overlapping is hardly necessitated. This feature, while productive of splendid results on steam and high-speed railways, tends to complicate and render more expensive the signal system of the ordinary electric railway without a corresponding gain in effectiveness.

To an impartial observer the point of view on the subject of signal and safety devices of the average street railway management appears rather peculiar. Roads that have been operating many years with practically no safety devices whatever are interviewed in regard to signaling, and invariably bring forward the point that no system will be considered whereby protection is not absolute. It is, of course, desirable that all protection of this character be made absolute, as a motorman or engineman who has passed a clear signal properly assumes that the block which is protected by said signal is clear and that he has the right of way. He, consequently, will not observe the same precautions that he would otherwise on a system unprotected by blocks. But it must be remembered that no system of automatic protection yet placed in service has proved infallible, and the problem at once resolves itself into a question of degree—which system is most nearly perfect? When, then, the management of a road that has existed for years without any form of automatic safety appliances decides that only the best developed type can be employed on their line, it appears that the leap forward is excessive and that their position is at the least inconsistent. From no protection to the most nearly absolute is a wide step, and one that on many lines could be made gradually with better results.

Naturally the financial aspect of any measure brought before them receives the first consideration at the hands of a corporation, so that a proposition that will appeal to an operating company must show itself to be an economical measure. But of necessity, the better the system of protection the more complicated it is, and the greater is the initial cost of installation. Furthermore, owing to its complexity and the multiplicity of its parts, various details are constantly needing repair and adjustment, entailing a large expense for maintenance. On nearly all electric railways, with the exception of two or three, the anticipation of these facts has settled the argument, and it has been decided that the cost was prohibitive. It, therefore, has appeared to the writer that if more moderate means were provided, devices of this character would be in more general use.

The point just considered, namely, the limitation of the use of signal systems by the perfection demanded by possible purchasers, is chargeable to the operating companies, but on the other hand, the manufacturers are themselves putting a more serious bar in the way of rapid development, for to a street railway man one of the greatest weaknesses in the present status of signaling appears to be the lack of adaptability shown by even the most advanced systems.

The fact that a certain system of safety devices is applicable to and of great benefit under some particular set of conditions does not make it necessarily follow that it could be adapted to any and all electric railways. The variety of local conditions met with on different roads or on different lines of the same road are so great that no system yet installed could be successfully applied to every other railway. In other words, each road must apparently have an entirely new system designed to meet its particular requirements, and there is therefore no standard equipment in this line of industry. This renders it an extremely difficult matter to judge of or decide upon the merits of the various systems offered, and nine out of ten managements, when confronted with the problem, solve it by tabling the entire matter indefinitely, or until some disaster, such as occurred in the Paris tunnel a short time ago, stirs the public to the point of securing from the Legislature enactments that compel the installation of apparatus that will make a repetition of the accident impossible.

As an illustration of how conditions affect the selection of a signal system may be mentioned the recent employment of the old "staff system" by a large electric double-track road while making repairs on one of its lines. The "staff system," which has been in the past used extensively on steam roads, and is still being used to a considerable extent in England and on the Continent, has been to a great degree displaced by other systems in this country, but in this particular case it was employed with entire satisfaction to meet an unusual set of conditions.

A simple signaling system, with no automatic means of preventing collisions, can be made to cover almost all ordinary circumstances or conditions, but no system of signaling without an automatic stopping device is worthy of consideration, inasmuch as several of the most serious accidents of recent years have occurred notwithstanding the fact that signals were set at danger.

It is usually shown in these cases that the engineman or motorman was physically disabled, that his attention was demanded elsewhere or that for some reason the signal was either not seen or was misinterpreted. The fallibility of the human factor has been so strongly emphasized by certain recent happenings that this consideration must be given full weight in the design and construction of the safety system, and it is imperative that the stopping of the train in case of danger be effected by automatic means. Modern equipment with its power brakes and automatic control would seem to lend itself with particular facility to this form of protection, and it seems reasonable that less elaborate means than those now employed by all automatic stopping systems could be utilized to obtain the same ends. The stopping apparatus now in vogue is almost without exception mechanical in its construction and must be made the object of the most unceasing care and attention to insure its proper action, as it is particularly subject to wear, derangement, lack of adjustment, etc.

The same is true of entirely mechanical automatic signals for protecting curves, etc., and with such systems the cost of installation must necessarily be very high, where for long distances the energy for operating them must be transmitted mechanically. This class of signals is notoriously unreliable, as the wear upon their parts causes frequent break-downs, and constant attention is necessary for any success in their use. This is doubly disadvantageous, as not only does their lack of certain protection react upon the installation of protective devices, but the excessive cost of maintenance produces the same effect. On the other hand, the success of the mechanical systems of interlocking, used in connection with block signaling, switching, etc., has rendered their use almost a necessity on all large roads. The ready and easy manner in which these are worked together has proved a mutual advantage, as either feature by itself would lose much of its value.

But in spite of the success of mechanical systems in certain local uses, it appears to the writer that the proper solution of the problem must be sought in another direction. Electricity through its well-known character of flexibility seems to lend itself admirably to signaling purposes. Indeed, the representative steam roads of the country have all adopted systems where it is used entirely or with modifications. It would appear that an electric road, having at all times a supply of current in the immediate vicinity, should be a particularly inviting field for this style of device. Indeed, a number of electric systems have been presented, but in each some vital weakness is apparent, and it may be well to touch upon the more important of these. It appears evident that any safety or signal system which necessitated the use of storage cells as a source of energy is at a disadvantage, inasmuch as the special attention required, the apparatus for charging them and the general disadvantages common to battery work make them a constant source of annoyance, especially in the colder Northern sections of the country.

Again, the idea on an electric road of giving up one or both of the running rails for signaling purposes is a question of no small moment, as the cost of copper for a return circuit is a very large item, and in view of the recent litigation instituted by certain cities against operating companies for damages due to electrolysis. The fact is that the track and line departments of all roads are about at their wit's end, with both rails at their disposal for the return current, to accomplish this purpose with small drop of potential and with little leakage to water mains and other piping, which must obviously offer low resistance to an electric current. A step forward was gained in this connection when an application was made of the fact that an alternating current has such characteristic differences from direct that the two could be used over the same circuit selectively. But the use of alternating current over a direct-current circuit for signaling necessitated the division of the track circuit into blocks, and the separation of the alternating-current circuits is attended with considerable difficulty, even with a low-voltage current of this character, when the rails must also be used for the passage of heavy return direct currents. The inductive characteristics and properties of alternating currents, in connection with the use of choke coils, make this possible, but the construction of a choke coil which will be wound of sufficient capacity to pass, without interruption or excessive resistance, the heavy direct currents, and still offer an inductive resistance to the alternating current, is extremely difficult of accomplishment, and in city service or in thickly-settled districts where headway is short and cross-overs, switches and special work frequent, the problem becomes well nigh unsurmountable.

Still another point which militates against the success of electric systems and one which has scarcely been given the proper consideration by the manufacturers, is that their different systems are not sufficiently protected against electrical discharges during storms. Annoyances due to this cause are particularly exasperating when it is remembered that during severe electrical storms, where other systems of despatching are at their worst, owing to excitement, a signal system should be particularly relied upon. Heretofore a suitable lightning arrester which was efficient and of extremely low cost so that it could be used at frequent intervals has not been on the market. But the recent advent of a lightning arrester of an entirely non-inductive circuit, small, compact, with no moving or adjustable parts, and which can handle repeated lightning discharges without losing its adjustment or efficiency, should offer a solution of the difficulty, as it appears to be the ideal arrester for the protection of signal apparatus.

These are perhaps the most striking faults apparent in present electrical systems from a railroad man's viewpoint, but notwithstanding these difficulties attendant upon the use of electricity for signaling purposes, the writer believes that in this line will the most satisfactory results be obtained, after experience has weeded out weaknesses such as the ones touched upon above.

Leaving the subject of mechanical or electrical systems, it may be well to discuss a point that applies to all forms of automatic signaling. In considering any system, an important point is whether it is a normal danger, i. e., whether any abnormal condition along the line, disconnection of wires or any other circumstance out of the ordinary causes the signals to go to danger. From a protective point of view this system is decidedly superior to any other, but from the operating viewpoint it has its disadvantages, as the slightest derangements of the apparatus, even if of no consequence, are continually causing tie-ups and blockades. On the other hand, the normal clear is a less expensive system, and certain details in connection with it are especially suited for high-class protection. While avoiding the chief fault of the normal danger, it combines the advantage of being much cheaper, with nearly as efficient protection, if certain details are carefully worked out and looked after. Practice has shown that cases where automatic signals have shown false indications do not exceed one per 100,000 operations. Such a remote possibility does not need to be guarded against by the additional apparatus required for "normal danger," which augments the danger of break-down and introduces faults difficult of detection.

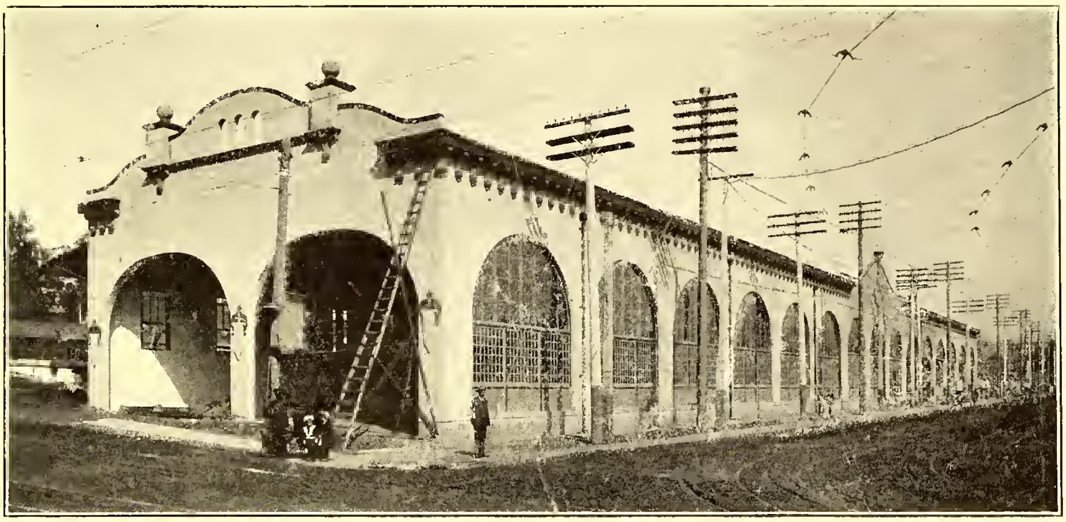
Having called attention to the more obvious weaknesses of present systems of protection, it should be interesting to summarize the details of a system that would answer all the requirements of street railway service, and toward the working out of which the manufacturers must strive, if the advance of signaling is to keep pace with other railway progress. What seems desirable is a system which must, primarily, be comparatively inexpensive to install and maintain, consequently having as few mechanical parts as possible, and which will, nevertheless, be as nearly absolute in its operation as is consistent with simplicity and economy. It must have an automatic stopping device and should lend itself with facility to interlocking or switching systems. Its construction should be such that the frequent spacing of blocks in congested districts will not offer prohibitive financial objections. It should not necessarily depend upon a large number of auxiliary parts, storage batteries, alternators, compressors, pipe line, etc., but should preferably derive its energy directly from the trolley, and should be arranged in such manner that when trolley is dead the signals would be at safety. The use of one or both of the running rails should not be a prerequisite, to the disadvantage of the return car currents. It should be so constructed that in case of derangement, non-operation will be indicated and still permit the running of equipment in defiance of signal, without long delays or extensive changes being entailed. It should be a system that will set a signal on the entrance of any class of equipment into the block, thereby obviating the possibility of signals being clear when block is occupied by a car or train not carrying the actuating device. It should be possible, in case of emergency, that track men or others can quickly set signals at danger, or in other words, that any signal can be readily set at danger by other means than a train entering the block. It should not require the use of oil lamps at night, as they necessitate constant attention and heavy maintenance expense. It should be sensitive to its regular means of operation, but not easily affected by extraneous causes. Last, but not least, it should be a system that does not necessarily require the constant attention of expert signal engineers, but which can be maintained by the regular road electricians. To include each and every one of the above details in one system may be difficult, but the system that will include the greatest number of such advantages will undoubtedly secure the electric railway business.

The next ten years will see rapid developments along the line of automatic signal and safety systems, and radical departures will be made from the methods now in vogue. Along the interurban roads the population is rapidly increasing, necessitating corresponding increase in the roads' service, and the riding public in general is demanding "real rapid transit." The consequence of these two developments is that it is becoming imperative that passengers be protected against accident, and progressive railway managements will realize that short headway, high speeds and heavy, valuable equipment cannot be operated successfully in the uncertain manner that is generally the practice at present. As soon, then, as the requirements of the average road are established and a general demand created for an apparatus, the manufacturing companies will bend every energy to produce that which their customers desire.

In this enlightened age the word "impossible" should be used very sparingly, and, in the writer's opinion, all that has been enumerated, and possibly even more, will have been accomplished before the close of the next decade.

HANDSOME NEW FREIGHT DEPOT OF LOS ANGELES-PACIFIC RAILROAD COMPANY

The new freight depot of the Los Angeles-Pacific Railroad Company, which has just been opened for use, is both handsome and commodious, as shown in the accompanying illustration. It is situated on the northwest corner of Bellevue Avenue and Buena Vista Street. The building is a one-story structure, in the Mission style of architecture, with a frontage of 400 ft. on Buena Vista Street and 100 ft. on Bellevue Avenue. Its long series of arched doorways gives a peculiarly picturesque effect, which is quite unusual in a building of this sort. The company is using the structure for both freight and express, and in it are also the freight offices. In one section of the long building has been fitted up handsome quarters for passengers.



NEW FREIGHT DEPOT OF THE LOS ANGELES-PACIFIC RAILWAY COMPANY

Ten sets of trackage run into the new depot, and several more will be placed on the adjoining grounds. On this corner the company owns a plot 200 ft. x 400 ft., and the present building is only the first of a group to be erected on this site.

The Los-Angeles-Pacific Railroad Company has just completed a pretty Mission style depot at the popular seaside resort, Playa del Rey, and plans are ready for a similar depot at Sawtelle. The company's new depot at Santa Monica is to be large and combines many unique and attractive features.

The Dayton & Troy Electric Railway is preparing to issue a complete list of names and addresses of parties adjacent to its line who desire summer boarders. Information will be given as to the number of persons that can be taken care of and rates per week.

RATES OF FARE ON INTERURBAN ELECTRIC RAILWAYS IN OHIO, MICHIGAN AND INDIANA

The subject of passenger rates on interurban roads is one which is of intense interest in these days when new roads are springing up all over the country. Not only are comparisons of figures of value to those who are promoting new lines, but they are of interest to those who find that while they are carrying a great many people their net earnings are not as large as those of some other electric railways doing a smaller business. The connecting up of many links and the building of through lines with a view to going after long-distance business are rapidly bringing the situation to a point where there must be something like uniformity of rates for a certain district. While, of course, local conditions are bound to influence rates in certain quarters, there seems to be no good reason why managers should not work together toward a uniformity of rates, particularly on through business. Steam roads have done this to a large extent, and in certain districts, rates per mile are nearly always uniform.

With a view of securing some light on this subject, the STREET RAILWAY JOURNAL recently corresponded with managers of nearly all the most important interurban roads in the district embracing Ohio, Michigan and Indiana, where the lines are becoming so interlinked as to form a great network of railways. The appended tables show the average rates per mile for various classes of business on thirty-six interurban roads in this district, viz., twenty-three in Ohio, eight in Indiana and five in Michigan, operating almost 3000 miles.

The figures show a wide range of rates, not only in the receipts per mile for single and round-trip tickets, but the rates and methods of handling commuters' tickets, mileage books, school tickets, etc. The highest rate per mile in this district is that of the Eastern Ohio Traction Company, which receives on an average of 2.21 cents for single-trip cash-fare passengers, while the lowest is that of the Michigan Traction Company, which receives but 1.4 cents per mile for the same service. The average round-trip rate on the Eastern Ohio is 2.11 cents, while the average passenger on the Detroit United system pays but 1.15 cents. Family commuters' books average only 0.88 cent on the Detroit United, while commuters on the Cleveland, Painesville & Eastern—owned by the same syndicate—pay 1.8 cents. Individual coupon books range from the extremely low rate of 0.56 cent on the Dayton & Xenia to 1.43 cents on the Pennsylvania & Ohio Railway. These last, however, are not exactly fair comparisons, as the limitations are different. The Fort Wayne & Wabash Valley has a mileage giving a rate of 1.2 cents per mile, while several roads have mileage at 1½ cents. School tickets range from 0.74 cent on the Interurban Railway & Terminal Company to 1.5 cents on the Pennsylvania & Ohio, with practically the same limitations.

While the rule does not hold good in every case, it is noticeable that rates vary according to the location of the roads around certain centers, and this can usually be attributed to the fact that the pioneer roads established the rates and the others followed the precedent laid down by them. Thus, in Ohio, the roads around Cleveland and Toledo approach very close to the 2 cents per mile rate. Roads centering at Dayton average about 1.75 cents per mile, although one of them is considerably lower than this. The original roads out of Columbus started with 1.5 cents per mile. One of them has since raised this rate, while another has abolished certain classes of low fares, bringing its average up somewhat. The Scioto Valley, the newcomer in that field, started with straight 2 cents per mile, with no reductions to any class of commuters' business, and in the face of strong steam competition, it appears to be making good by reason of superior service.

The Detroit United, the parent system in Michigan, has a number of local rates, but it states that its average per mile is 1.41 cents. Other roads in this State have followed this example, and except for the Detroit, Ypsilanti, Ann Arbor & Jackson, which has recently raised its cash-fare rate, though not its ticket rate, those mentioned are all considerably below the average for both Indiana and Ohio roads. In Indiana the pioneer interurbans immediately met with strong steam competition, and for a long time some of them attempted to do business at the suicidal rate of 1 cent a mile for cash fares and lower than that on commuter and mileage business. The great Indiana Union Traction system gradually increased its rates until they now average 1.5 cents per mile for single trip and 1.25 cents for round trip, and the other roads radiating from that city followed this example quite closely. When the Muncie, Hartford & Fort Wayne was built, the line connecting with it was selling tickets at 1 cent per mile, and it was thought by some that it would have to follow this example. Some of the owners, however, made a bold stand for better rates and adopted 1.8 cents as standard. The fact that this is one of the most prosperous properties in the country indicates that this stand was right. The Fort Wayne, Van Wert & Lima, building into Fort Wayne, has a 2-cent rate, and the Western Ohio, which connects with it at Lima, has recently adopted this rate. The Indianapolis & Martinsville has announced an increase to this rate, although its round-trip rate will be 1.5 cents.

Owing to the fact that a number of Ohio roads have recently increased their rates, the average cash fare on the twenty-three roads reporting is considerably higher than the average for either Michigan or Indiana. Only two roads still hold to the 1.5-cent rate, and these are planning to increase.

The tables show interesting facts as to the practice of selling tickets, and the indications are that it is becoming popular. Twenty-seven out of thirty-six roads sell single-trip tickets, and six offer lower rates to those who buy these tickets at stations. All but seven sell round-trip tickets, and all but five of these give reductions from double the single-trip fare. Sixteen roads have family commuters' books, while twenty-five have individual commuters' books. The plan of selling mileage books seems to be declining in favor; only nine out of the thirty-six still sell these books. A year or two ago quite a number of roads issued such books for 1.25 cents a mile, good for anyone and with no limit as to time, but at present but four roads have such books. The Toledo & Western has mileage at 1.5 cents, no time limit, while the Dayton & Western has the same rate with a limit of six months. Three roads give reduced rates on Sundays and three have "week end" rates, good for three days.

Much interest will be attached to the rates given by roads parties to the agreement of the Ohio Interurban Railway Association. As is commonly known, this plan embodies a book of 5-cent coupons good on a number of roads, and giving a reduction of 16⅔ per cent from the local cash-fare rate of the individual road on which the coupons are collected. It will be seen that on the ten Ohio roads referred to herewith using this book, the average rate is 1.48 cents, as compared with 1.37 cents, the average rate on the old form of local mileage books, which on the the majority of roads are unlimited as to time or user, whereas the Ohio coupon book is good only for signer for one year. The one Indiana road using the book gives a rate of 1.67 cents, while the Michigan road which has adopted it receives 1.3 cents. The majority of the Indiana roads have declined to adopt the Ohio scheme, as they claim their rates are too low to admit of so great a discount. This is undoubtedly correct in the case of those roads which receive only 1.5 cents for local cash fares, but, as indicated herewith, several are getting considerably more than that and could afford to enter into the arrangement as well as one of the Ohio roads which receives only 1.52 cents for local fares. The plan proposed by the Indiana roads of issuing a book giving

10 per cent discount would hardly meet with popular favor, because the average round-trip rate on the Indiana roads is already 13½ per cent less than the single-trip rate.

Discussions before the associations in these States are having a tendency to create a uniformity of ideas, and the sentiment is growing. Where rates are governed by franchise conditions, as they are in many cases, the problem is a difficult one, but it has been overcome in a number of cases. Roads which have increased their rates in the face of railroad competition have almost invariably won out. The steam lines were driven to reduce their rates to hold even a portion of the short-haul business, and if the electrics cannot make money at 1.5 cents per mile, it must be ruinous for the steam roads. Once the competition is withdrawn, the steam road almost invariably increases the rate to equal that of the electric, and even where the steam road continues to give lower rates, numerous cases can be cited where the electrics are getting the business at higher rates, due to more frequent service and superior accommodations. There is at least one road that added $40,000 to its earnings in one year by increasing from 1.5 cents to 1.75 cents per mile, and this road is now seriously considering increasing its mileage rate to 2 cents.

TABLE I.—RATES OF FARE IN CENTS PER MILE ON ELECTRIC INTERURBAN RAILWAYS IN OHIO.

NAME	Single Cash Fare.	Single Ticket Fare.	Round Trip.	Family Commuter.	Individual Commuter.	Mileage.	O. I. R. A. Coupon Books.	School Tickets.	Sunday Rates.	Week End Rates.	Other Rates.
Lake Shore Electric	1.82	1.62	1.53	[4]1.55	[1]1.25	....	1.51	[10]1.00	....	....	....
Cleveland & Southwestern	1.82	1.82	1.61	[14]1.44	[17]1.27	....	1.51	[10]1.00	....	....	....
Cleveland, Painesville & Eastern	2.00	....	1.81	[18]1.80	....	....	....	....	....	....	....
Cleveland, Painesville & Ashtabula	2.00	....	....	[14]1.50	[14]1.50	....	....	[10]1.00	....	....	....
Northern Ohio Traction & Light Co.	1.90	1.90	1.55	....	....	....	....	....	....	....	....
Pennsylvania & Ohio	1.87	....	1.66	[4]1.43	[4]1.43	....	....	[10]1.50	....	....	....
Eastern Ohio Traction Company	2.21	....	2.11	[4]1.83	[1]1.10	....	....	[2]1.10	....	....	....
Columbus, Delaware & Marion	1.50	1.50	[3]....	[4]1.25	[13]1.25	[4]1.25	....	....	....	....	....
Columbus, Buckeye Lake & Newark	1.75	1.75	1.50	....	[13]1.00	[4]1.25	....	[5 13]1.00	....	....	[7]1.58 [8]1.22
Scioto Valley	2.00	2.00	1.80	....	....	....	....	....	....	....	....
Appleyard Lines	1.50	1.50	1.50	....	1.25	....	....	....	....	....	....
Toledo & Western	2.00	2.00	1.75	....	[12]1.00	[4]1.50	....	[10]1.00	[5]1.33	[5]1.33	....
Toledo & Indiana	2.00	2.00	1.80	[14]1.50	....	....	1.67	[16]1.00	....	....	[6]1.33
Dayton & Western	1.75	1.75	1.50	....	[9]1.00	[14]1.50	1.40	1.00	[5]1.25	....	[6]1.25
Dayton & Troy	1.61	1.61	1.27	....	....	....	1.35	[1]1.00	....	[5]1.07	....
Western Ohio	2.00	2.00	1.80	[1]1.50	....	....	1.67	[1]1.00	....	[5]1.33	....
Dayton & Xenia	1.52	1.52	1.36	....	[13].56	....	1.16	....	....	....	....
Dayton & Northern	1.80	1.80	1.50	[13]1.00	[13]1.00	1.25	1.50	....	....	....	....
Dayton, Covington & Piqua	1.75	....	....	[13]1.25	[13]1.25	....	1.47	....	....	....	....
Cincinnati, Dayton & Toledo	1.83	1.83	1.65	....	1.00	....	1.52	....	....	....	....
Cincinnati, Lawrenceburg & Aurora	1.75	....	1.58	....	[13].90	....	....	....	....	....	....
Interurban Railway & Terminal Co.	1.95	1.85	1.64	[12]1.39	[13].82	....	....	[13].74	....	....	....
Stark Electric Railway	2.01	1.76	1.76	....	[13]1.00	1.50	....	....	....	....	....
Average	1.84	1.77	1.63	1.45	1.09	1.37	1.48	1.03	1.29	1.24	....

[1]50 rides, good 30 days. [2]44 rides, good 30 days, school days only. [3]5 cents less than double single trip rate. [4]No limitations. [5]Limit of 3 days. [6]Party of twenty. [7]Party of 30 to 100. [8]Party 300 or more. [9]52 rides, good 30 days. [10]40 rides, good 30 days, school days only. [11]500 miles, good six months. [12]90 days limit. [1] 30-day limit. [14]Limit of 6 months. [15]Party of twenty, one day limit. [16]One cent per mile, not less than 5 cents collected, good 30 days. [17]60 day limit. [18]For family, no time limit.

TABLE II.—RATES OF FARE IN CENTS PER MILE ON ELECTRIC INTERURBAN RAILWAYS IN MICHIGAN.

NAME.	Single Cash Fare.	Single Ticket Fare.	Round Trip.	Family Commuter.	Individual Commuter.	Mileage.	O. I. R. A. Interchangeable Book.	School Ticket.	Sunday Rates.	Week End Rates.	Other Rates
Detroit United Railway	1.41	1.41	1.15	[1].88	[2].87	....	....	[3].75	....	....	....
Detroit, Ypsilanti, Ann Arbor & Jackson	2.00	1.50	1.50	....	....	1.25	....	[4]....	....	....	....
Detroit, Monroe & Toledo	1.60	1.60	1.50	....	....	....	1.30	1.00	....	....	....
Michigan Traction Company	1.40	1.40	1.20	....	....	....	....	....	....	....	....
Saginaw Valley Traction Company	1.53	....	....	[5]1.33	[2]1.14	....	....	....	[6]1.33	....	....
Average	1.58	1.48	1.34	1.10	1.00	1.25	1.30	.87	1.33	....	....

[1]Good for season or year between certain stations. [2]Limited to 30 days for individual. [3]Good in township on school days. [4]2½-cent ticket good any distance in one township. [5]No limitations. [6]Round trip, one day only.

TABLE III.—RATES OF FARE IN CENTS PER MILE ON INTERURBAN ELECTRIC RAILWAYS IN INDIANA.

NAME	Single Trip Cash Fare.	Single Ticket.	Round Trip Ticket.	Family Commuter.	Individual Commuter.	Mileage.	O. I. R. A. Interchangeable Book.	School Tickets.	Sunday Rates.	Week End.	Other Rates.
Indiana Union Traction Company	1.50	1.50	1.25	....	....	[1]1.25	....	[2].75	....	....	....
Indianapolis & Cincinnati Traction Co.	1.50	....	....	....	[3]1.31	....	....	[4].75	....	....	[5].94
Indianapolis, Columbus & Southern	1.60	1.60	1.30	[6]1.10	....	....	....	....	....	....	....
Indianapolis & Martinsville Rapid T. Co.	2.00	2.00	1.50	[7]1.25	[8]1.00	....	....	1.25	....	....	....
Indianapolis & Eastern	1.50	1.50	1.50	....	1.35	....	....	....	....	....	....
Fort Wayne, Van Wert & Lima Tr. Co.	2.00	2.00	1.80	....	....	....	1.67	....	....	....	....
Fort Wayne & Wabash Valley	1.50	1.50	1.35	....	[8]1.00	[9]1.20	....	[8]1.00	....	....	....
Muncie, Hartford & Fort Wayne	1.80	....	....	[10]1.35	[10]1.35	....	....	....	....	....	[11]1.45
Average	1.68	1.68	1.45	1.23	1.20	1.22	1.67	.94	....	....	1.19

[1]Good until used. [2]Good only on school days to scholars attending free public schools only. [3]160 five cent rides for $7, good for one year. [4]100 five-cent rides for $2.50, school days only. [5]Park excursion tickets. [6]50 trips in 30 days. [7]Good six months. [8]Good 30 days. [9]$10 book for $8, good one year. [10]Books of 25 rides between stations, no limitations. [11]150 five-cent coupons for $6, no limitations.

THE ATTITUDE OF THE STEAM ROADS

BY LOUIS BELL, PH. D.

The larger growth of electric traction depends in no small measure upon the relations which may be established between the new motive power and the old, between the electric line struggling for expansion and the steam road bending its energy toward the repression of competition. And yet it is a mistake to assume, as is so often done, that there is any inherent antagonism between the motive powers as such or between those employing them.

The struggle which has arisen is far older in its origin than the electric motor or the steam engine. It springs from elemental forces in human nature. The real question is not whether the train-mile can be made more cheaply by one method of traction than by another, but whether certain vested interests that have come to regard the traffic of the country as their private and sole property are to be disturbed in their peaceful enjoyment of monopoly or not. There are never wanting Jesuitical economists who spring to the defense of monopoly on account of real or supposed savings in operation, but the broad fact remains that, in spite of these savings, no monopoly likes to take the chances of even small competition, and never fails to throttle it if possible.

Therefore, just as soon as the electric road passed out of the petty tramway stage and began to do a larger work, existing railroads at once looked upon it as an active rival engaged in grand larceny of the traffic which they themselves had by usage regarded as a permanent asset. Hence every kind of obstacle has been put in the way of electric roads, beginning with active work in the lobby and ending with stalling a freight train across the site of a legally authorized crossing, together with all the legal and illegal varieties of obstruction that lie between. But that adverse attitude had nothing to do intrinsically with the motive power question, except as this proved a dangerous element in competition—it was and is purely an expression of that compound of open war and secret assassination that forms the substantial basis of modern business methods. The vested interest merely extended to the newcomer the customary cheerful greeting couched in the pleasant phrase of the late Tom Corwin: "We welcome you with bloody hands to an inhospitable grave." Doubtless the locomotive would have met a similar reception had electric traction first gained possession of the field.

One should not therefore attach too much importance to these preliminary business amenities. Really the steam roads are watching the later development of electric traction with very keen and genuine interest. Railway men, like all others, may be divided into conservatives and radicals. The former instinctively oppose innovations, the latter foster them. It is not so many years ago that the railroad itself was denounced as unnecessary, unsafe and impracticable. But now the railroad is the most important adjunct of civilization, as electric traction may one day become the most important adjunct of general railroad working. Putting aside all prejudice, the real questions which touch the railway manager with respect to electric traction are these: Is it thoroughly practicable? Will it pay? Can I afford to adopt it? As to the first count there is little doubt that electric traction is as an engineering feat entirely practicable on either a small or a large scale. The recent work on interurban systems has made this entirely clear. The work at Zossen has shown the feasibility of working at higher speeds than any yet attempted with ordinary locomotives, and the one point as yet undemonstrated is the feasibility of operating electrically very long lines like the great "trunk systems" of our country. Even as respects these it is very doubtful whether any railway man who has looked into the matter seriously is really skeptical as regards physically successful operation. There may be doubts about the financial wisdom of the policy, and indeed even electrical engineers are disposed to go slowly and conservatively in this matter. No man who knows the locomotive fails to realize that it is wonderfully well adapted for its work and will not be replaced except for ample cause.

On the financial side the railway man regards the status of the electric road as less certain. There is, of course, no doubt, merely as a matter of experience, that for purely urban and suburban work the modern methods of electric traction are singularly successful, and that surely as a matter of business they do pay. Wherever electricity has been substituted for steam in such work the improvement in service has produced so great a gain in traffic as would justify even a considerable increase in purely operative expense, and as a matter of fact this operative expense has been rather in favor of electric traction.

When, however, one comes to trunk line operation a very different set of conditions is encountered. Electric traction by the methods now customarily followed requires a large expenditive factor proportional to the length of the road. This falls heavily upon lines with light traffic, and many electrical engineers, including Mr. Sprague, who may fairly be called the father of electric traction, have expressed serious doubts as to the applicability of present electric methods to much of the larger work of transportation. Beyond a certain density of traffic, not yet definitely determined, but certainly not greater than is found on most suburban lines, electric traction pays. What it can do with lines having lighter traffic remains to be seen, and there is nothing unreasonable in the waiting policy followed in this particular matter by most steam railway men. It is not a policy of unfriendliness, but merely an exhibition of reasonable caution.

Recent innovations in electric traction, enabling longer sections of road to be operated from a single power station, tend to reduce the factor of cost, which depends on the length of the road, and in so far tend to make electric traction economical on longer and longer lines; but these innovations are still sub judice, and a conservative business man is not justified in jumping at conclusions regarding them. Railway men very naturally look askance at the multiplicity of generating or sub-stations necessary on the ordinary direct-current system, and also object to the third-rail supply as dangerous and unreliable on long lines. These exceptions are, upon the whole, well taken, and it is now pretty clear that the success of electrical working on long lines hinges upon the practicability of a distribution carried clear up to the car at high voltage without sub-stations, requiring either large investment or the attendance now necessary. The experimental single-phase systems now in operation are going to give much valuable information, but they have made thus far much less rapid headway than was to be expected when the first announcements were made, so that no useful data are either now at hand or likely to be quickly available. This side of the matter is strictly up to the electrical engineers, and until they have something to report, which is both definite and favorable, they should be neither surprised nor annoyed at an attitude of good-natured incredulity on the part of railway managers.

To be really successful any electric system for trunk lines must be workable in connection with steam locomotives upon the same tracks for many years to come, save in the single possible case of special trunk lines for very high-speed traffic, a class of work not yet seriously undertaken. And what is more, it is not likely to be undertaken at present unless some one of the existing railroads takes up the task on its own account. The truth is that a road operating at 100 m.p.h. or so could hardly be constructed in this country as an independent enterprise. Its operation would so tend to demoralize traffic conditions on existing lines that such a road would be fought from its very inception and, if tried, would probably cost for franchises alone a sum so great as to absolutely forbid further progress. Some day two great trunk lines may fall out and then one of them may use the high-speed electric road as a club upon the other, but for the present electric traction must make its way upon merits other than those dependent upon high speeds. The writer has little doubt that within a few years the difficulties of long-distance electric traction will be so far solved that at least the passenger traffic can be handled very economically, and perhaps the freight service as well, but even then there will be left the third fundamental question of ability to pay for the change.

On its face it would seem that a system of demonstrated economy must be worth adopting, but the solemn fact remains that not all railroads are prosperous enough to enjoy increasing the funded debt for a change of motive power. The thing which belongs to the insiders is the stock, and hence the insiders, if the road is doing well, have little interest in increasing the funded debt unless the change will considerably more than pay for itself. If the road is not prospering, the added burden of fixed charges cannot be comfortably carried, so that electric traction must not only show a certain saving, but a large one as well before railway managers will really be enthusiastic about it. And the fact is that a change which must necessarily much increase the present capital charge per mile is one that must be for very good cause. Most railroads are far from rolling in wealth, as their stockholders know to their sorrow, and must go slow in making expensive, even if profitable, changes.

A very interesting phase of the present situation is the growing tendency of steam roads toward picking up competing and branch electric roads and running them in conjunction with the main system. From a business standpoint it is probably often good policy, but it is not always likely to give the purchasers a sound notion of the economics of electric traction. In the first place, the gentle promoter has now and again, by shrewd bluffing, unloaded upon the railway man a property in physically bad condition, and has thereby given him as well some very melancholy notions of depreciation. In the next place, an electric road which can really be made to pay well in competition may not make a good showing when it gets into the hands of the railway and is made to share traffic therewith upon some arbitrary basis. In other words, it may make a rather shabby showing, merely because it has been used so as to stop loss on the steam line. The two facts just noted probably account for most of the instances in which electric lines thus acquired have not made a good showing. The electric branch line worked as a feeder stands upon a very different basis. Railway men are beginning to learn its advantages and to use it intelligently, and in many cases it is likely to prove of great advantage to the community. As time goes on it may prove a stepping stone to larger electric work. The modern railroad manager is thoroughly wide awake to what electric traction is doing. He dislikes it as a competitor for obvious and sufficient reasons, and he is perhaps ultra-conservative in his views of the motor as a substitute for the locomotive, but in the long run he is thoroughly open to conviction and is likely to take an active hand in future electric operations. What is more, the experience of the expert steam railway man is going to be very valuable to the larger work of electric traction.

The famous sink hole on the Urbana, Bellefontaine & Northern Traction Company's line south of Bellefontaine, in which the company has dumped thousands of yards of gravel, stone, timber and brush, has again become unruly. Time and again the track at that point has gone down all the way from 5 ft. to 10 ft., and every effort to secure a firm foundation for the roadbed has been baffled.

CORRESPONDENCE

DUPLICATE DAY CARDS

Philadelphia, Pa., April 25, 1905.

Editors Street Railway Journal:

Street railway companies should require conductors to make out their regular day cards in duplicate. This can be accomplished by means of a sheet of carbon paper between the two cards. An exact duplicate of the day cards in the hands of the depot superintendent would have obvious advantages. With these duplicates before him, he could figure out the riding for the previous day and make recommendations to the main office regarding changes in time-tables, etc.

Such duplicates kept in the office could also be produced on the days when the conductors are settling their shortages, and these would prevent any feeling of dissatisfaction or chance for dispute about shortages. Peter Robinson.

CAR VENTILATION

New York, April 26, 1905.

Editors Street Railway Journal:

An article on "Car Ventilation" appeared in the April 15 issue of the Street Railway Journal. It is safe to take exception to the principal propositions stated therein. These are, the quantity of air required per passenger; the proper manner of procuring that supply; the extent of vitiation of air, particularly by the presence of carbon dioxide, within the safety limit; and the method of determining the latter.

First—the quantity of air required per passenger. The article referred to proposes, "in general 353 cu. ft. of fresh air per hour, or 5.89 cu. ft. per minute, should be introduced per passenger, in order that the percentage of carbon dioxide may not rise above the point specified." Dr. Dudley, chemist for the Pennsylvania Railroad Company, considers Dr. Parke the leading authority on ventilation, and Dr. Parke says, "30,000 cu. ft. per hour is the average" for an adult—eight and a half times more than your writer would provide. Many other authorities could be cited, their estimates ranging from 20,000 cu. ft. to 30,000 cu. ft. per hour per person.

Second—the writer would have us believe that the proper method of introducing fresh air into a car (he makes no suggestion as to a method for the removal of the vitiated air from the car) is through the deck sashes and the occasional opening of the doors. Will the traveling public believe it? The general experience was recently concisely stated by Dr. Hurty, secretary of the Indiana State Board of Health: "I never think of riding in the inside of the cars, but always stand out on the platform in cold weather, because the air inside is always so extremely foul. * * * No passenger will permit a window to be lowered, and if doors are held open for even a moment someone will rise and close them. The same is true in regard to the ventilators in the roof. I have repeatedly opened these ventilators, only to see them closed again by passengers." In an article that appeared in "The Railway Surgeon," Dr. Hurty says: "Transom ventilation in the deck fitfully and insufficiently changes the air, and is altogether a method which is contrary to physics. Such method does not and cannot ventilate a car properly, and sometimes, as when cold air falls upon the heads and necks of passengers through the transoms, is almost worse than no ventilation." Many other authorities could be quoted, but this will suffice for a fact so patent.

Third—In his article he says: "It is the writer's opinion that 20 parts of carbon dioxide in 10,000 would not be excessive under these circumstances." Dr. Parke states: "Fifty have proved fatal and 15 dangerous." Among the most interesting experiments recently made by many Boards of Health is that of Detroit, Mich. The standard adopted by the Detroit Board of Health for the city schools is 9 parts of carbon dioxide in 10,000 parts of air. Chemical tests made of the air taken from ninteen city and suburban cars demonstrated that only five samples analyzed below 20 parts carbon dioxide, five between 20 parts and 30 parts, and nine exceeded 30 parts.

This dangerous condition is wholly unnecessary. The proper application of the old principle of the exterior deflector, supplemented by interior deflectors, not only supplies the required amount of fresh air, without draft, but at the same moment expels the vitiated air from the car. ROSS TAYLOR.

EFFICIENCY OF BRAKES ON TRUCKS HAVING A ONE-MOTOR EQUIPMENT

STANDARD STEEL CAR COMPANY

Butler, Pa., April 17, 1905.

EDITORS STREET RAILWAY JOURNAL:

The STREET RAILWAY JOURNAL has contained several articles recently as to whether it is more desirable to use one or two motors per truck on a double-truck car. In these articles nothing has been said in regard to the difficulty of properly braking a short wheel base truck with a one-motor equipment. Except for the maximum traction truck, I believe no inside hung brake rigging has been produced for trucks with one-motor equipment which, without too much complication, successfully reduces the pressure of the brake-shoes on the idle wheels, so as to prevent skidding and flattening them when a maximum allowable pressure is given to the shoes on the wheels which carry the motors. For this reason, when a one-motor equipment is used, the maximum air-brake pressure has to be reduced below the pressure which would skid the idle wheels. This reduces the emergency efficiency of the brake, and thus increases the chance of accidents. Several designs of brake rigging which overcome this defect have been used, but I believe that all of them have been abandoned as too complicated and as requiring too much care to maintain them.

When the short wheel base truck having an outside hung motor and an inside hung brake rigging (and no other brake rigging should be used), it is the usual practice to have the live and dead levers of the same length, and this makes the pressure of the shoes on all of the wheels equal in amount. It is impossible to so change the lengths of the live and dead levers as to make much difference in the brake-shoe pressure, and to make the brake-shoes wear evenly, it is necessary to have the bottom brake rod horizontal so that no variation in the length of the live and dead levers below the brake beam can be made. In a short wheel base truck having all wheels the same size, the only successful way of reducing the brake-shoe pressure on the idle wheels is by using two dead levers, the second lever being linked to the first lever, and being supported at the top end by a bar which is riveted at one end to the transom and at the other end to the end frame of the truck. While this form of brake rigging has been used on many trucks, it has been discarded as not satisfactory.

With a pair of swing bolster trucks weighing 5100 lbs. each, having all wheels the same size, a wheel base of 4 ft. 6 ins., one Westinghouse No. 93 motor, outside hung on each truck, live and dead levers the same length, a car body weighing 18,000 lbs., and no passenger load, the maximum brake efficiency attainable before skidding the idle wheels will be about 75 per cent of what it would be if the shoes on the wheels which carry the motor could be given the required additional pressure. With a heavier car and a lighter motor, this percentage will be slightly greater.

With the long wheel base truck having one motor hung inside, the loss in brake efficiency is much less than 25 per cent, as a larger proportion of the load is carried on the idle wheels. It would be interesting to know how much this loss of brake efficiency on a large street railway system will increase the accident expense. The writer believes this should be considered before deciding in favor of a one-motor equipment.

W. G. PRICE.

THE IMPORTANCE OF FORESIGHT

Newark, N. J., April 22, 1905.

EDITORS STREET RAILWAY JOURNAL:

The ability to "look ahead" is one of the necessary qualifications for the successful electric railway man. Especially should the foreman or superintendent in charge of operation at the car house be able to "look ahead" and not leave everything until the last minute.

For instance, in the matter of assigning men to their various runs, the runs should be assigned and posted two days ahead instead of one. It is good practice to keep a large blank book at the depot in which the men can write their names for the particular days on which they wish to be excused from work. There should also be a rule to the effect that any man who is taken sick suddenly, or for other reasons cannot take out his car, should send written notice to his depot at least ten minutes before the time for his run to go out. By having these regulations the starter will always be prepared for emergencies. If there are thirteen extra motormen at the depot, for instance, and if ten of them have asked to be excused for a certain day, the starter will only excuse about seven, so there will always be enough extra men on hand to use in case some other men send in work they are sick, the rule being that such word must be in the hands of the starter ten minutes before the run goes out. If the person in charge made it a rule to mark up the runs two days ahead these matters could be arranged much more smoothly.

Another matter in this connection is watching the weather on Sundays and holidays. The general manager of a large system should make it a rule that the official weather forecast for Sundays and holidays should be sent to all the depots as early as possible in the morning. With this official forecast in hand the starter is in a better position to decide whether to keep the extra crews at the depot or order them home. The writer knows of an instance when it looked like rain on a certain holiday and several extra crews were ordered home. The weather later in the day turned out fine and the riding became heavy, but extra cars could not be run out because there were no crews, and the company lost considerable traffic.

The same thing is true in snow storms. If everybody waits until the snow is heavy on the ground before thinking of snow-plow crews, it frequently becomes necessary to put on the plows motormen who may have just been working half the night, or it may be all day, and who are then compelled to do twelve or thirteen hours continuous work on the plows, whereas by the exercise of a little foresight, extra men could have been assigned in advance to snow duty, and it would not be necessary to put plows in charge of men who are half asleep and half frozen. JOSEPH ANDERSON.

REBUILT TIRE-TURNING LATHE

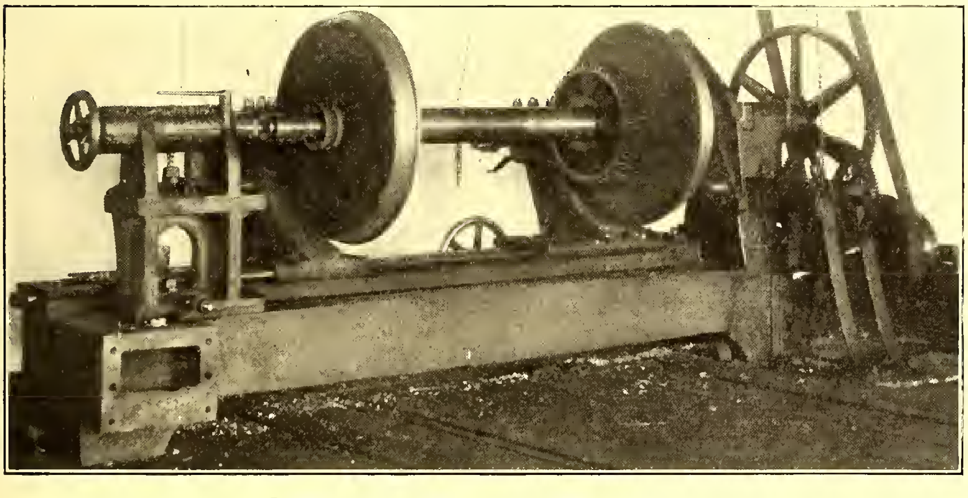
The accompanying engravings illustrate the novel lathe for truing up tires of steel wheels which was described by John Millar, master mechanic of the International Railway Company, of Buffalo, in the STREET RAILWAY JOURNAL for April 22, 1905, page 742. As stated in the article, this lathe when new was a 10-in. swing-axle lathe with single tool carriage. The lathe was rebuilt to enable the tire-turning work to be done upon it, and the company thereby was saved the expense of a special wheel-turning machine.

By means of intermediate castings, the head and tail stocks were raised so that the lathe now swings 36 ins. An extra tool block and carriage were designed in order that both wheels could be turned up simultaneously. The engravings show the compound rests for holding the cutting tools and also the feed mechanism, which is controlled by an eccentric on the main spindle connected by chain to rocker shaft above and then to ratchet levers on the tool rests. To obtain the required speed it was necessary to make a reduction from 35 ft. to about 6 ft. per minute. This was accomplished by double gearing 9:1, then 5:1, and using a three-step cone. The driving mechanism is clearly shown in the engravings.

THE INSTRUCTION OF EMPLOYEES IN BERLIN

In the April number of the "Zeitschrift für Kleinbahnen," Operating Engineer Kindler gives an extended account of the methods employed in engaging and teaching applicants for car service on the Grosse Berliner Strassenbahn. At the time the lines were electrified, most of the motormen and conductors were chosen from the old horse car lines, but in more recent years they have been taken from many professions. The instruction course covers four weeks of ten hours daily instruction. Successful applicants must be between twenty-one and thirty-five years of age, of good character and physical condition. Preference is given to men who have already been employed as track men or car cleaners. Instruction in the duties of motorman or conductor is given under the supervision of a traffic inspector and engineer, and directly by one of the older employees, who possesses the ability of conveying his knowledge in simple language.

The conductors and motormen receive exactly the same instruction, which consists of two parts—the theoretical, comprising lectures and questions and answers, and the practical part, comprising the carrying out of all the work of a motorman. The second portion takes up the greater part of the instruction period. The following is a record of the twenty-nine days work as carried out by a corps of recruits, who are divided into groups of about ten men each:



STEEL TIRE-TURNING LATHE, BUFFALO

First Day.—Description of the overhead work; making connections on a car without current.

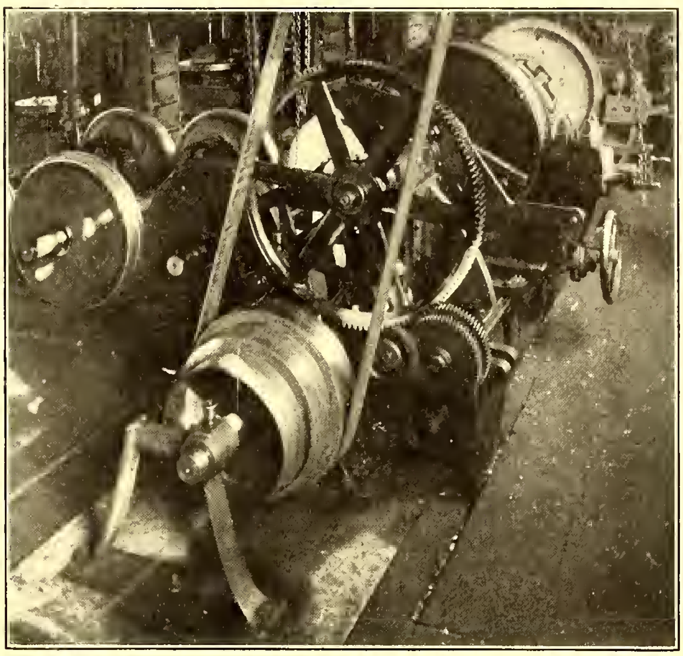
Second Day.—Origin, characteristics, effect and course of the electric current; handling circuits as on first day.

Third Day.—Description of the separate parts of the car; lifting a car in accidents; handling circuits as on first day.

Fourth Day.—Description of the electrical fittings of the car; switching cars; experimental trip with instructions for going over temporary tracks.

Fifth Day.—Description of magnetic and air brakes; experimental trip on suburban divisions and to a place where track work is being carried on.

Sixth Day.—Repetition of instruction and questioning; trip to the instruction school, and study of the parts of the overhead construction there exhibited.



DRIVING MECHANISM ON TIRE-TURNING LATHE

Seventh Day (Sunday).—Employment as conductor on trailers or in miscellaneous service.

Eighth Day.—Description and examination of the car motors in the shops; experimental trip on suburban lines with right-of-way instructions at crossings and switches.

Ninth Day.—Practice in emergency braking; practice trip.

Tenth Day.—Instruction regarding air brakes and their use.

Eleventh Day.—Repetition of sixth day; practice trip with double-deck car.

Twelfth Day.—Lecture on the duties of conductors and motormen when taking a car from the car house; practice trip through streets having dense traffic.

Thirteenth Day.—Instructions regarding conduit operation; handling of apparatus in connection with conduit system; riding over and examination of conduit division.

Fourteenth Day.—Same as seventh day.

Fifteenth Day.—Study of the conduit system; practice trips with single and double-truck cars, with one or two trailers; practice in ordinary and emergency braking.

Sixteenth Day.—Instruction regarding cars for conduit service and troubles in the conduit system; riding over divisions having heavy grades; throwing of the wheels, sliding on flat rails with brake-shoes applied to the wheels. (The wheels are observed through an opening in the floor of the car.)

Seventeenth Day.—Practice in operating the car; studying car repairs and cutting out defective motors; failure of apparatus at starting; practice in placing controller handle in running and braking positions.

Eighteenth Day.—Instructions regarding lighting, and coupling of other cars; riding along certain lines with fire department warning signs; riding over switch points, conduit divisions (particularly over parts without current and electrically-operated switches); practice in locking switches.

Nineteenth Day.—Repetition of the sixth day; instructions as to methods to be pursued in case of accidents; handling of the telephone; the preparation of written and telephonic reports of accidents, collisions and disturbances in service; practice trips.

Twentieth Day.—Repetition of sixth day; riding on certain lines with different types of cars.

Twenty-first Day.—Same as seventh day.

Twenty-second Day.—Same as sixth day; practice trips with cars equipped with air brakes.

Twenty-third Day.—Reading of the general rules; running of cars on regular lines.

Twenty-fourth Day.—Reading of the rules for conductors; operation of cars on regular lines with wattmeters and per cent of power used by different motormen.

Twenty-fifth Day.—Reading of the rules for motormen; operation of cars on regular lines with wattmeters.

Twenty-sixth Day.—Practice in operating cars.

Twenty-seventh Day.—Reading of police rules; practice in operating lines.

Twenty-eighth Day.—Same as the twenty-seventh day.

Twenty-ninth Day.—Examination.

It frequently happens that the new men are sent out to report damages caused in accidents. Such opportunities offer a great deal of practical instruction for the new men, as they learn how to get out of difficulties with a few simple tools. They are also sent to observe the methods adopted to break up blockades on the lines and to space the cars so that no one feeder division will be carrying too high a load.

The greatest stress is laid on the use of a minimum power. By means of a wattmeter the teacher shows the influence of the weight of a car, of up-grades and down-grades, of dry and clean or slippery rails, of unnecessary moving of the controller handle, and how to save power during coasting. The work of the motors and brakes is observed by the students from the interior of the car, through the open floor, and in this way they learn the causes of the difficulty in starting on slippery rails. The examination which follows covers questions regarding the work and rules to which they have been giving their attention. If this is satisfactorily passed, a certificate of efficiency is made out, which is signed by both the engineer and the traffic inspector. Upon this each student is placed in the care of an experienced motorman for ten or twelve days to operate over the lines on which he is to be permanently employed.

To keep the car men informed regarding all changes in equipment and operation, and to become acquainted with their wants, the company has arranged for weekly meetings at each car house, at which every employee must be present at least once a month. Besides this, all regulations are published in an official paper that appears every two weeks.

APRIL MEETING OF NEW ENGLAND STREET RAILWAY CLUB

The monthly meeting of the New England Street Railway Club was held at the American House, Boston, on Thursday evening, April 27, there being about 150 members in attendance, President E. E. Potter presiding. Dinner was in order from 7 to 8 o'clock, and after a short business meeting, H. F. A. Kleinschmidt, superintendent track welding department of the Lorain Steel Company, Johnstown, Pa., presented a paper on "Electric Welding of Street Railway Tracks." Many views were shown by the aid of a stereopticon. Mr. Kleinschmidt opened his remarks by stating that the first application of electricity to the welding of street railway joints was made in Boston in 1893 by the Johnson Company.

Continuing, he said in part:

During the next two years welding was done in Boston, Cleveland, Detroit and St. Louis. Some of the track welded at that time is still in use to-day. But on account of breaks which developed, the company withdrew from the field in 1895. The attention of street railway men everywhere had been attracted by the novel idea of doing away with joints altogether, as well as by the method employed. When operations were suspended the idea that electric welding was a failure was widely advertised. During the next two years the company experimented almost continually. In the summer of 1897 the speaker was given charge of the experimenting. He was to prove electric welding a failure, so that the company would stop spending money on it, or make it a success. Having an erroneous idea that the electric current deteriorated the steel, he was confident that he could make a failure of it. It developed into a success.

In the early welding by electricity the fact that steel must be worked after having been raised to a welding temperature was lost sight of, and this is undoubtedly the reason why the first welding in Boston and other cities was not successful. The resulting brittleness and coarse crystallization of rails electrically welded was attributed to some mysterious action of the electric current on the molecules of the steel. Soon after taking up the experiments an endeavor was made to overcome this by abstracting the heat from the weld as quickly as possible after the weld was made. The readiest means at hand for doing this was to allow the contacts to remain in place after the weld was made. The result of this test was surprising. The joint showed a tensile strength of 342,900 lbs., and the bars broke instead of the rail.

To determine whether the good result was due to the rapid cooling or the pressure under which the welds were cooled, a series of three sets of tests was next made. In the first set the joints were welded in the ordinary way, the pressure being released immediately after the welds were made. The second set was made with the contacts remaining in place against the welds, but without pressure. In the third set the pressure was held against the welds until the metal was cooled below a glowing heat.

The results proved that the proper way to make a weld is to work the metal while it is cooling, either under pressure or by hammering. In bringing out this principle in electric welding there was, of course, nothing new. It has always been well known that to make a strong weld the metal must be hammered after it is stuck together. When steel is raised to a welding temperature it is impossible to prevent the molecules from arranging themselves in a coarse crystalline structure unless the metal is worked while it is cooling. This applies whether the heating agent is electricity, the ordinary forge fire or molten metal poured around the rail. By no other process of welding can so perfect a weld be obtained, and one which can be so thoroughly depended on, as by the electric welding process. The great advantage of electricity over all other forms of heating is that it begins to heat in the center, and by the time the visible portions of the parts to be welded arrive at the proper heat there is no doubt that the center is in the proper state for welding. It is often seen from welds made in the forge fire that what appears to be a perfect weld breaks and shows no sign of having welded within. By applying and continuing a heavy pressure immediately after the metal has reached a welding heat, the molecules are compressed and the coarse grain prevented, resulting in a weld of extreme toughness and strength. To realize what the strength of an electrically-welded joint amounts to one may imagine a heavy locomotive suspended in the air from an electrically-welded joint, and then remember that the weight of the locomotive is not equal to the ultimate tensile strength of the joint, and all this weight is concentrated on the comparatively small area of the web of the rail surrounding the end welds.

The personnel of the West India Electric Company was changed at a meeting of the stockholders held in Montreal last month. F. L. Wanklyn, the president, and his associates in the management of the company all retired. To succeed them were elected the following directors: Messrs. James Hutchison, C. J. Fleet, W. G. Brown, R. McKeen, A. R. Oughtred, J. McDuff. The former directors were: F. L. Wanklyn, president; J. R. L. Ross, vice-president; W. B. Chapman, J. Hutchison, J. Reid Wilson, C. E. L. Porteous, Fayette Brown.

THE QUESTION BOX

Among the general topics discussed in this instalment are grade crossings with steam railroads, fare making and fare collection, city tracks for interurban cars and street sprinkling. The value of benefit associations and clubs, the preparation of extra lists and employees' records are treated in the employees' department. The removal of wheels and axles is discussed in the master mechanics' department.

A.—GENERAL

A 31.—On a high-speed interurban electric railway, what precautions should be taken to protect crossings where the line cuts a public highway? Please describe the precautions you take at such points.

All highway crossings at grade on the private right of way of the Boston & Worcester Electric Railway are protected by signs reading, "Electric Railroad Crossing. Stop, Look, Listen." These are illuminated at night by incandescent lights. Also, motormen are required to blow the whistle when approaching these crossings. Street crossings on the highway location are protected by signs reading, "Lookout for Electric," and motormen blow the whistle and slow down at such of them as are so situated that a carriage could not see an approaching car.

K. P. ARMSTRONG.

One of the greatest dangers on roads where the conductor is supposed to go ahead and flag the car over crossings arises from the fact that the employees are apt to become careless and the motorman will either fail to bring his car to a full stop or the conductor will neglect to go ahead and make sure that the crossing is safe. As a precautionary measure, the writer suggests the placing of a time stamp in a box near the crossing. Instructions should be issued that when the car approaches a crossing the motorman, if it be a closed car, or the conductor, if it be an open car, should go to the stamp and stamp on the back of a regular transfer ticket bearing the current date, the exact time, and then deposit same in a box at the crossing. It will be obvious that this will require the car to come to a full stop, and if the employees are shirking their duties the system will quickly reveal the delinquencies.

WM. J. KELLY,
Jersey City, N. J.

Grade crossings should be abolished wherever possible on all important crossings. Where absolutely necessary, too many real precautions cannot be taken.

S. W. CANTRIL, Supt.,
Denver City Tramway Co.

A 32.—Where an electric railway crosses a steam road, what is the usual arrangement between the electric road and the steam road for the maintaining of a flagman at such points?

We have two steam railroad crossings on our line. Both steam road crossings are double track, and both are located right at the foot of steep hills, one a 10 per cent grade and the other 11 per cent. The 11 per cent grade is 500 ft. long and the 10 per cent grade is 800 ft. long. There is a curve at the top of each of these hills, so that cars have to go around this curve and start a little way down the hill before the motorman can see the steam railroad crossing at the foot. Our arrangement for getting over the 11 per cent grade crossing when going down the hill is as follows: The car on arriving at the top of the hill makes a full stop. It then goes down around the curve a distance of about 200 ft., at a point where the motorman can see the steam road crossing, and makes another full stop. We have this arrangement with the steam railroad people. They keep a gateman at this crossing, and the steam road has installed what is termed "a staff and ball," used in the operation of the crossing for the steam and electric cars. The staff is about 20 ft. high, and there is a large red ball hung on an endless chain so it can be run up and down as needed. When this red ball is at the masthead it gives the electric cars the right of way, and if a steam train should approach the crossing when the ball is in this position it would have to stop. When the ball is lowered the steam road has the right of way and the electric cars must stop. At night a red lantern is used in place of the red ball. The method of getting down this hill is as follows: When our car arrives at this particular place, where it can see the railroad crossing and the ball signal, the car is brought to a full stop, and the motorman by ringing his gong attracts the attention of the gateman. If it is safe for the car to proceed, the gateman runs the ball to masthead, which gives the electric car the right of way over the crossing. After the motorman gets the proper signal, which is the ball at masthead, he goes down the hill and makes another full stop about 20 ft. before reaching the track, the conductor of the car then gets off and goes forward onto the steam road tracks, looks both ways for trains, and if none is approaching, he signals motorman to come ahead. We have one other safety appliance which is used in connection with the mast and ball on this hill. We have a circuit of lights, five in number, which are operated by the crossing gateman. Three of these are red lamps put on a high pole at the top of the 11 per cent grade. The other two are white lamps and are located on the post at the crossing. By turning a switch located near the crossing gates, the gateman, of course, can close the circuit, thus lighting his two white lamps, and also the three red ones on top of the hill. When these three red lamps, located at the top of the hill, are burning, they can be seen by the motorman of the approaching car at a distance of about 1000 ft. Any time when the crossing is blocked by a steam train or a train is approaching, the gateman turns on these lights, and the electric car, on approaching the top of the hill, does not come on down around the curve at the top as long as these lights are burning. When the crossing is clear, the gateman turns off the lights and the motorman proceeds. In addition to the foregoing, we have a sand house built half way up the hill, and for six months in the year we keep a man on this hill all of the time while the cars are running to keep the tracks properly sanded.

L. F. TAYLOR, Supt.,
Augusta (Maine), Winthrop & Gardiner Ry.

As in most cases the steam road is in before the electric railway desires to cross it, the flagman has to be maintained at the expense of the electric railway.

S. W. CANTRIL, Supt.,
Denver City Tramway Co.

A 35.—What precautions do you take to avoid accident to persons getting on or off at points where it is necessary for conductors to go ahead to flag over crossings or other dangerous points?

The motorman should look back to see that no passengers are getting on or off.

C. E. PALMER, Supt.,
Cincinnati, Dayton & Toledo Tract. Co.

Motorman is required to look back to see that no one is getting on or off before starting. Conductor is required to remain on right-hand side when flagging, so that he may also see whether or not anyone is getting on or off before giving signal to motorman to go ahead.

S. W. CANTRIL, Supt.,
Denver City Tramway Co.

A 36.—In making up a schedule of fares for an interurban road, is it better to base rate on mileage or with reference to municipal boundaries? What is your practice?

Where possible, we make five cents the minimum fare collected between any two stations. We are governed by franchise provision within city limits. All one-trip and round-trip tickets, through and local, are based on mileage, and commutation tickets are made upon rates to meet steam line competition.

SUPT. OF TRANSPORTATION.

It should be based on a mileage rate where it is possible.

C. E. PALMER, Supt.,
Cincinnati, Dayton & Toledo Tract. Co.

Rates should be based on mileage, but road should be divided into five-cent zones for local passengers.

FRANCIS G. DANIELL, New York City.

Our fares are based on mileage.

S. W. CANTRIL, Supt.,
Denver City Tramway Co.

A 37.—What is the best method of collecting and checking fares on interurban roads?

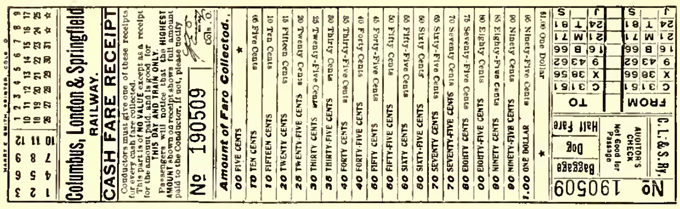
We collect the total amount of the fare at the time the passenger pays; that is, if a passenger pays a 20-cent fare, we collect 20 cents and register at the time one fare. The conductor gives the passenger three 5-cent receipt coupons, which the conductor collects at each fare limit.

H. C. PAGE, Gen. Mgr.,
Berkshire St. Ry. Co., Pittsfield, Mass.

Have motorman look through car and ring bell before starting.

W. T. NARY, Supt.,
Hoosac Valley St. Ry. Co., North Adams, Mass.

A very grave question. We use tickets, round-trip, single-trip, half-fare and interline tickets. Have just abolished mileage (may substitute interchangeable coupons of the Ohio Interurban Rail-



CASH FARE RECEIPTS, APPLEYARD LINES

way Association). For cash fares paid on cars we use cash fare receipts like sample herewith (size, $2\frac{3}{8}$ ins. x $7\frac{7}{8}$ ins.).

THEODORE STEBBINS, Gen. Mgr. for Receivers,
The Appleyard Lines in Ohio, Columbus, Ohio.

On our long interurban cars it is not possible for one man to check number of fares collected, for the reason that we have three different compartments and passengers frequently change from one compartment to another. Under these conditions checking should be done by two men, one in the front end of the car, and one in the rear.

J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Tract. Co.

For outline of discussion on interurban tickets and form of ticket adopted by Ohio Interurban Railway Association, see STREET RAILWAY JOURNAL, Dec. 3, 1904, page 1005, and Jan. 14, 1905, page 92.

EDITORS.

Collect fares of any amount and register same on a register showing how many fares of each amount are collected. Give each passenger a hat check with points punched between which fares have been collected.

FRANCIS G. DANIELL, New York City.

We offer inducements to passengers to purchase tickets from agents. By this method conductors do not handle more than 25 per cent of the cash receipts. We also use registers that record and classify fares received.

SUPT. OF TRANSPORTATION.

As our interurban business is mostly regular round-trip business, we sell a round-trip ticket from any one point to any other at 5 cents less than single fare each way, except when one-way fare is 5 cents. These tickets are all obtained from one form, the conductor punching proper fare and destination. A "duplicate" ticket is used. One-way cash fares are checked by cash-fare receipts. Conductors ring up once for every passenger, and must have some form of transportation representing the exact number of people designated by register. Passengers riding on passes are required to sign a receipt for each ride, these receipts being rung up as tickets. Tickets are sold only at the terminal stations of the line and by conductors. Since the reduced round-trip ticket was put on sale, the use of cash-fare receipts has been reduced to only about 5 per cent of the total number of passengers, and this greatly simplifies the matter of collecting and checking fares.

R. P. STEVENS, Supt.,
Everett (Wash.) Ry. & Elec. Co.

A 38.—What are the underlying principles upon which a traffic agreement between a city road and an interurban road for joint use of city tracks should be made?

Each company keeps fares collected in its own district.

W. T. NARY, Supt.,
Hoosac Valley St. Ry. Co., North Adams, Mass.

City rates should be guaranteed at minimum to cover power used and maintenance of track and overhead construction. We have a number of contracts, both where we give entrance rights and receive entrance rights, nearly all based on $2\frac{1}{2}$ cents per passenger. If I represented a city company, and were making a new contract, I would be disposed to require a fixed price per trip, plus all city fares collected if it were a long city haul, say more than 2 miles and a half, or $2\frac{1}{2}$ cents per passenger if it were a short city haul. The latter figure is profitable on a mile and a half haul, such as we have in one instance, and unprofitable on a 4-mile haul, with interurban cars weighing $42\frac{1}{2}$ tons each. We are operating under some ten contracts, giving trackage rights, and these give a decided variety of experience.

THEODORE STEBBINS, Gen. Mgr., for Receivers,
The Appleyard Lines in Ohio, Columbus, Ohio.

The interurban company should pay 50 per cent of the gross receipts collected in the city. That is, if the city fare is 5 cents, the city company should receive $2\frac{1}{2}$ cents for each passenger riding over city tracks in interurban cars. In addition, on account of the excessive weight of its cars, the interurban company should pay a proportion of cost of track maintenance on the city lines over which it runs. On this basis the interurban company should not pay anything additional for power. The interurban company should furnish and pay for its own car crews, but these men should be under the jurisdiction of the city company's officials within the city limits. The interurban company is, of course, responsible for all damages arising from accidents caused by its cars.

ANONYMOUS.

If possible, the interurban company should own an interest in the city tracks.

C. E. PALMER, Supt.,
Cincinnati, Dayton & Toledo Tract. Co.

A 39.—Where an interurban company seeks the right to run cars over a city company's tracks, what compensation should be paid by the interurban company for this privilege, and what should be the basis upon which the compensation should be determined?

Interurban company should pay city company not to exceed $2\frac{1}{2}$ cents per passenger for each passenger carried over city tracks; and the whole 5-cent fare should be turned over to the city company, when any passenger boards the interurban car inside the corporate limits. City company should keep up repairs to the track and overhead work.

J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Tract. Co.

This question and A 40 are intimately related. In some cases the city line pays the wages of crew, furnishes power and tracks and collects a city fare from each passenger, which entitles him to a city transfer. In other cases the interurban company pays a fixed amount per passenger to the city company and pays its own crew. The company paying the crew should assume all risk of accidents. The wheels of the interurban cars must be made to conform to any special form of rail the city lines may have.

FRANCIS G. DANIELL, New York City.

A 40.—When an interurban company uses city tracks jointly with a city company, what is the best agreement as to the handling of crews; as to the responsibility in cases of accident; as to collection of fares within city limits; as to the various mechanical questions involved, including weight and type of cars, dimensions of wheels, power, etc.?

Our practice as an interurban company is to allow our own crews to handle our cars over the city tracks. We find less friction by adhering to this practice.

J. R. HARRIGAN, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Tract. Co.

In our contracts the interurban company always furnishes car and crew, and the city company track, overhead construction and power. The interurban company is responsible for accidents and registers passengers within city limits on separate registers. As to mechanical questions, of course, the track construction must be heavy enough for the interurban cars. We have had operated over our tracks, cars weighing as much as 55 tons. We have grooved rails, and wheel flanges must not be more than $1\frac{1}{4}$ ins. deep and $\frac{7}{8}$ in. thick, depending on the type of the rail.

THEODORE STEBBINS, Gen. Mgr., for Receivers,
The Appleyard Lines in Ohio, Columbus, Ohio.

A 48.—Information is requested regarding the sprinkling of streets by street railway companies, and particularly the proportion of street usually sprinkled and the amount paid by the cities and municipalities for this service. Does your company sprinkle streets? If so, on what terms?

We are under contract with the city of Providence for sprinkling not to exceed 60 miles of street at the rate of 15 cents per mile. However, up to the present time we have not been able to cover the full 60 miles of street, but we increased considerably during the last year the mileage sprinkled. Under our arrangement the city furnishes us with water free of cost, providing hydrants at convenient points for filling the sprinklers, and pays us, as mentioned, at the rate of 15 cents per mile. Our standard sprinkler at the present time is of the independent air compressor type, the tanks having 4000-gallon capacity.

ROBERT I. TODD, Gen. Mgr.,
The Rhode Island Co., Providence.

We sprinkle the streets upon which our tracks are located and collect what we can in the form of voluntary subscriptions from the abutting property owners. Last season was the first we attempted anything of this kind, but we received sufficient revenue from residents to more than pay the expense of sprinkling. We expect to extend this service the coming season.

A. E. DEMANGE, Pres.,
Bloomington (Ill.) & Normal Ry. Elec. & Htg. Co.

We have an arrangement with the city of Norfolk whereby we sprinkle a portion of the streets. As a matter of fact our sprinkler will water practically the whole width of any one of the streets in Norfolk, as they are very narrow. When we first began this arrangement the company purchased a small sprinkler mounted on a single truck, the city paying half the cost of the machine, and furnishing water free for sprinkling those streets inside the city limits. The company pays for all water used outside the city limits. After one or two years we found this sprinkler was too small and we purchased a double-truck pneumatic sprinkler having a capacity of about 4000 gallons. With the aid of the air pressure a width of 60 ft. can be sprinkled easily with this sprinkler. We have considered the practicability of using the sprinkling equipment for fire purposes, but nothing definite has been done in this direction as yet. We do, however, use this sprinkler for carrying water down to our ferry boat which runs from Willoughby Pier to Old Point Comfort, it often being the case that water cannot be procured at Old Point; this saves us the trouble of bringing the boat to Norfolk for fresh water supply.

R. T. GUNN, Gen. Supt.,
Norfolk Ry. & Lt. Co.

B.—EMPLOYEES

B 22.—Do you have a benefit association for the men? How is this association handled and what advantages does it offer? The editor will appreciate receiving copies of the constitution, by-laws and reports of associations of this kind.

This company has a benefit association, and it is only the members of this association who have the privilege of using the rooms provided by the company. The association pays the men $1 per day and gives them a free doctor when sick, and pays $150 in case of death. E. J. RYON, Supt., Schenectady Ry. Co.

We have a mutual benefit association among our employees, and 90 per cent of the men are members of the organization. The officers are elected at the annual meeting, all of the officers being from the ranks of the employees, each department being entitled to representation upon the board of trustees. The members of the board of trustees are allowed one-half day each month with pay to transact the business of the association. The secretary is allowed one day each week with pay for the purpose of finding out the condition of sick members, making out his reports, etc. The association is provided with club rooms over the company's office in the center of the city. These club rooms are provided with billiard and pool tables, cards, checkers and other games, daily papers, weekly and monthly magazines and the technical journals, relating to the street railway industry. J. E. DUFFY, Supt.,
Syracuse Rapid Transit Ry. Co.

Yes, we have an association known as the Tramway Mutual Aid Association. It is run with no expense for officers or clerk hire, as the work of conducting the same has been undertaken by the company's officials and the employee members. The company donates one-fourth of the money paid in by members each month; so that employees receive insurance for less than actual cost. The plan provides for death and sick benefits. The details of its working will be found in the STREET RAILWAY JOURNAL for June 13, 1903, page 879. S. W. CANTRIL, Supt., Denver City Tramway Co.

B 23.—What are the advantages in providing club rooms for the use employees? What is your practice in this regard?

The advantages of the club rooms for employees have a tendency to keep the men away from saloons and to create a friendly feeling among the men. E. J. RYON, Supt., Schenectady Ry. Co.

We have never made the experiment and think it undesirable to cultivate intimacy among the men. We prefer that they seek their social associates elsewhere, rather than among their fellow employees. J. R. HARRIGAN, Gen. Mgr.,
C. B. L. &. N. and C. N. & Z., Columbus, Ohio.

B 24.—What do you think of organizing employees' bands, ball clubs, bowling clubs, etc.? What is your practice in this regard, and what advantages have been gained?

The organization of employees' bands, ball clubs, etc., we believe to be all right. While we have no band, we have bowling clubs, and have organized ball clubs, and it is our practice to encourage all employees in friendly sports, making it just as pleasant as possible for the men in every possible way. E. J. RYON, Supt.,
Schenectady Ry. Co.

We would not encourage organization of any character among our employees, in the belief that it would ultimately lead up to the formation of a labor union. J. R. HARRIGAN, Gen. Mgr.,
C. B. L. & N. and C. N. & Z.,Columbus, Ohio.

It does not meet with our approval, as such organizations take the time of a number of men when we most need their services.
S. W. CANTRIL, Supt., Denver City Tramway Co.

B 25.—How do you handle your extra list?

Extra men are in order for runs according to the time they have been in the service of the company. Extra work is divided as evenly as possible among all the extra men.

C. LOOMIS ALLEN, Gen. Mgr.,
Utica & Mohawk Valley Ry. Co.

Our extra list is handled by rotation, equalizing as much as possible the extra work so that all men are able at least to make a living while on the extra board. E. J. RYON, Supt.,
Schenectady Ry. Co.

Our extra list is a revolving list. We find this works very satisfactorily, as all men then have a chance for their share of th. work, and the different classes of runs are divided better in this way. This list is posted at 4 o'clock every afternoon, giving the names of the regular men who are off, and the extra men who are to take their runs the following day; also the time that the men assigned for morning trippers shall report. Those not needed for the morning report are required to be at the car houses at 10 o'clock. Those that are left report again at the car house at 4 o'clock, for the evening trippers. On this road nothing less than seven hours counts for a day's work so far as a man's position on the list is concerned.

J. E. DUFFY, Supt., Syracuse Rapid Transit Ry. Co.

All extra men stand in the same relation to a run that is temporarily open. The first man in is first to be out. In the event of a vacancy in a regular run, the extra man longest in our service is given the place if qualified. J. R. HARRIGAN, Gen. Mgr.,
C. B. L. & N. and C. N. & Z., Columbus, Ohio.

When a man is employed he is placed at the foot of the conductors' or motormen's extra list, as the case may be. Extra men are marked up for runs in regular order, so that all men have the same opportunity for work. As vacancies occur in the regular runs, the first extra man on the system is given first opening.
S. W. CANTRIL, Supt., Denver City Tramway Co.

B 26.—Should each company keep records of employees and answer all questions about a man who has left its employment?

By all means keep a record of the employees. This record should not be given to anyone except to street railway managements, for mutual protection, and must be treated as confidential.

G. E. MILLER, Supt.,
Union Elec. Co., Dubuque, Iowa.

For our own benefit as well as that of our friends we think it good practice to keep such records.

A. L. NEEREAMER, Traffic Mgr.,
Columbus (Ohio) Delaware & Marion Ry. Co.

The value of keeping such records is now generally recognized. The courtesy of supplying to other companies information concerning former employees is usually appreciated, and exchange of information of this kind is mutually advantageous. EDITORS.

B 27.—What do you consider the best system for keeping records of conductors and motormen?

The card system makes the best means of keeping records of trainmen. A. L. NEEREAMER, Traffic Mgr.,
Columbus (Ohio) Delaware & Marion Ry. Co.

E.—MASTER MECHANICS' DEPARTMENT

E 141.—Plans and descriptions of a "home-made" sand drier are requested. How do you dry sand on your road?

We have a large stove with sheet-iron hopper on outside, having perforations in the bottom. J. CHAS. ROSS, Gen. Mgr.,
Steubenville (Ohio) Tract. & Lt. Co.

E 148.—What apparatus do you use for removing and replacing wheels and axles under cars?

We recently had occasion to ascertain the shortest length of time in which a pair of wheels could be replaced under a car. An elevated car came into the shops with a pair of disabled wheels in the trailer truck, and the car was wanted immediately for service. The erecting foreman was allowed to pick five selected men for the work in order that a record time for this work might be determined. The car was placed upon one of the pit tracks, and everything was prepared for the work in the way of getting jacks, tools, etc., ready. The first operation consisted of jacking the car up off of the truck; this was done with ordinary screw jacks. While this was being carried out by two men, two others were engaged in loosening the journal-box fastenings for the pair of wheels to be taken out, while a third got the new pair of wheels in readiness. By the time the car was lifted high enough to clear the truck the journal-box holding bolts had been removed so that the truck could be lifted off of the axle, which was done by means of one of the air lifts provided for the purpose. After this the journal boxes were transferred to the new axle and the latter put into place. Then the truck was lowered upon the new axle and run under the car, when the journal-box fastenings were replaced and at the same time the car body was lowered upon the truck. The entire operation from start to finish took exactly 30 minutes, which is a new record for this work, and shows what can be done in an emergency with the proper arrangements.

JAMES WILLIAMS, Gen. Foreman,
Thirty-Sixth Street Elevated Shops, Brooklyn Rapid Tran. Co.

An effective scheme for removing axles with the wheels is in use at the Warehouse Pt., Ct., car house of the Hartford & Springfield Street Railway. It was designed by W. F. McCoy, master mechanic of the road, and consists mainly of a hydraulic jack with an 18-in. table, and a 4-ft. lift set in the ground at the bottom of the pit below a removable section of track. The company's cars are all of the double-truck type, and the closed cars are equipped with four GE 67 motors each, the total weight being about 25 tons. Suitable wooden blocking is also a part of the equipment, together with a cradle of 4-ft. 8½-in. gage, which travels on wheels upon a small track running in a pit at right angles to the pit, over which the car is run to be dismounted. In removing the wheels the bolts holding the lower transom of the truck are first loosened, together with the axle bearing caps. The transom having been removed, the car wheels and axle which are to be taken off are run upon the removable section of track just over the hydraulic jack. A water pressure of about 60 lbs. per square inch is then turned on, the jack table rises and lifts up the entire end of the car and truck through the medium of wooden blocking placed between the table and the axle. The motors are then fastened to cross pieces of timber placed inside the car over the trap doors, and the car body and truck are blocked in position. The rails of the movable section of track are now taken out and the jack lowered. The axle and its pair of wheels follow the jack table, and as it descends, the wheels lodge in the cradle which is waiting to receive them on the track at right angles to the pit over which the car is standing. The cradle is run out into its own pit and the wheels are taken up to the floor level by means of an ordinary block and tackle hoist. New wheels and axles are placed under the car by a reverse process. Mr. McCoy states that the time required to remove a set of wheels and replace them by a new set is considerably less than an hour, and in a recent instance when it was desired to place a car in service at the earliest possible moment the work was done in 35 minutes, this being the time elapsing between the running of the car into the car house and running it out again with a change of wheels. Two men are required to do the work. He further states that if the usual scheme of jacking up cars by hand were followed in his car house, the required time would be four or five hours, with two men at work. H. S. KNOWLTON, 218 Church St., Newton, Mass.

Have removable section of rails over pit. Wheels are lowered by chain blocks suspended from cross timber put through open car windows and supported by struts outside of car.

J. CHAS. ROSS, Gen. Mgr.,
Steubenville (Ohio) Tract. & Lt. Co.

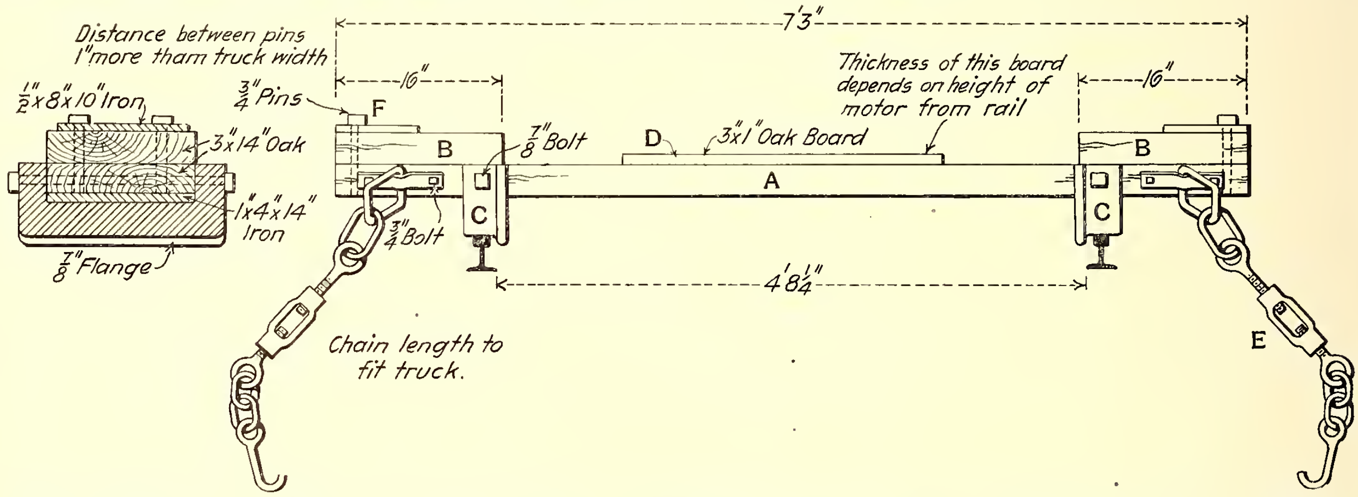
A satisfactory arrangement for removing wheels from cars is to attach screw jacks to the rails, by which the frame of the truck may be lifted off the wheels; an adjustable section of the rail can be then removed and the wheels dropped into the pit.

MASTER MECHANIC.

E 153.—What is the best method of cutting circular hole in car dashers for headlights?

A satisfactory way to cut circular hole in a car dash for headlight is as follows: Drill a hole in the center large enough to take a ½-in. bolt; then fix a cutter in the end of a bar, which also has a hole in the center for ½-in. bolt; draw the bar up to the dash by means of the bolt and turn it about the bolt as an axis; the cutting tool will then describe a circle, and after a few turns will cut entirely through the dash. There should be a plate on the back of the dash with circle groove the size of the cut.

MASTER MECHANIC.



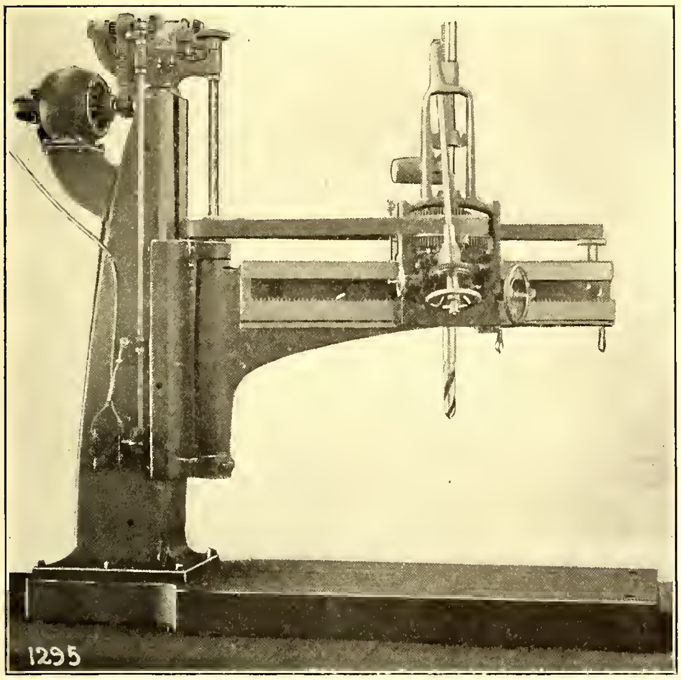
ARRANGEMENT FOR BRINGING IN CAR WITH BROKEN AXLE USED BY THE COLUMBUS, DELAWARE & MARION ELECTRIC RAILWAY

E 156a.—What is a good method of getting a car disabled by broken axle or other causes to the car house?

The accompanying sketch shows a wrecking plank which has been used with good results on this road for bringing in cars crippled by reason of broken axle, bolts in gear, and other causes. The outfit consists of an oak plank (A), 3 ins. x 14 ins. x 7 ft. 3 ins. To this are bolted two pieces of old steel tires (C), taken from wornout wheels. These pieces of tires have recesses to receive the oak plank. The flanges of the tires, or shoes as we call them, should be good, and the points of the flanges should be ground "V-shaped," so they will take switches readily. The top blocks (B) should vary in thickness, depending on the height of truck frame from the rail, but we make them about 3 ins. thick. The pins (F) drop into holes in the plank and block and are 1 in. wider apart than the truck frame. There are chains and hooks on both sides of the plank so that the disabled truck is held in position on the plank. It will be understood that when in use with a disabled single-truck car, we do not use the side blocks (B) or the center board (D), but simply set the disabled wheels on the plank, fasten the hooks to the side of the truck frame, couple on a good strong car, cut in good motor on the cripple and go to the car house. With double-truck cars we find the best place to set the plank is just inside the broken axle, so the wheels just clear the plank, fasten the hooks, and the car is ready to go to the car house. We found it necessary to sheathe the plank (A) with ⅛-in. sheet steel, as the plank only clears the rail 2⅜ ins., and the crossings cut it out very fast. J. C. GILLETTE, Master Mechanic,
Columbus, Delaware (Ohio) & Marion Elec. Ry. Co.

NEW MOTOR-DRIVEN TOOLS FOR THE RAILWAY SHOP

With the increasing amount of study that is being devoted by railway officials to the equipment of shops for the maintenance of railway rolling stock, many developments have appeared, not only in the form of new styles of tools for all kinds of machining work, but also of new methods of shop arrangement and also of driving for the best results and maximum pro-



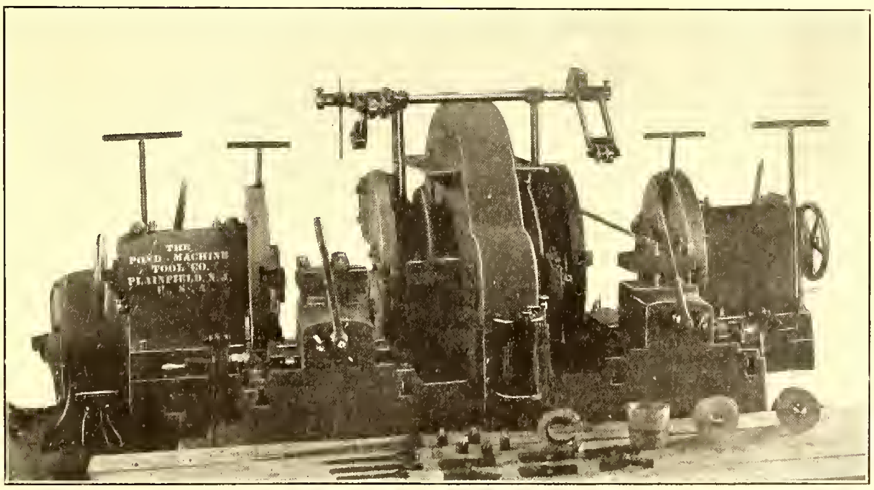
ELECTRIC MOTOR DRIVING A 6½-FT. RADIAL DRILL

duction. The latter consideration has proven much more important than it was formerly thought to be, and it is found that changes in driving methods have had almost incredible effects upon the production factors of the machines driven; in fact, it is now evident that, with the recent use of the new high-speed tool steels for cutting tools, the productive capacity of any given machine is practically a function of the driving capacity and the possibility of changing the driving speeds in order to always keep the cutting speed up to the limit of the capacity of the tool. The Niles-Bement-Pond Company, recognizing this important feature of the operative considerations, has made a special study of problems of driving for the best results, and accordingly has developed the electrical method of driving each tool individually to great advantage. The accompanying examples illustrate what has been accomplished in this line and will be of interest to those having new or increasing shop problems on their hands.

The three tools illustrated herewith are examples of standard types of tools built at the Pond works of the company, at Plainfield, N. J., which have been interestingly modified in design to accommodate the electric-motor equipments for variable-speed driving. In many of the earlier designs of motor-driving applications, the methods of mounting the motor upon the tool were indicative of inadaptibility, and were even bulky and unsightly, to say the least. These tools are interesting for the remarkably convenient arrangements that have been worked out and the utter inoffensiveness of the motor applications as compared with the earlier designs, or even with the older style of belt driving. In these instances not only have the motors been located in the most convenient and out-of-the-way places, but also the variable-speed controllers have been located so that they are most convenient to the operator when watching the work; the desire has, in fact, been to so locate the controller that the workman may have conveniently at hand a wide range of easily changeable speeds so that the cutting tool may be driven at the most effective and economical speeds, and moreover, the adjustments of speed made without detracting the attention of the operator from the work.

The large drilling machine illustrated herewith is an interesting example of a most convenient and effective application of motor driving to a 6½-ft. Pond radial drill. The use of belts in connection with the drive is entirely eliminated, so that the drive is not only not unsightly, but is, moreover, positive and not rendered inefficient by deleterious slippages of belts. As may be noted, the motor is conveniently located upon a neat bracket at the rear of the top of the column, from which connection to the drive of the tool is made through a Morse silent chain; the silent chain gives all the advantages of silent operation, etc., inherent in the belt drive, but in addition is a positive drive in that it obviates the possibility of slipping. The application of the motor drive has, however, required very little change in the design of the tool; the bracket at the top of the column which carries the reduction gearing is changed only so as to carry a silent chain sprocket instead of two belt pulleys as was formerly the case. The result is that the former belt-driving arrangement appears offensively clumsy in comparison to the new arrangement as here illustrated. The controller is here located upon the rear side of the drilling arm with the operating handle projecting downward, so that while out of the way the operating handle is most conveniently located for the operator. The motor used here is the variable-speed motor of the Northern Electrical Manufacturing Company, Madison, Wis., which operates upon the two-wire system by field control.

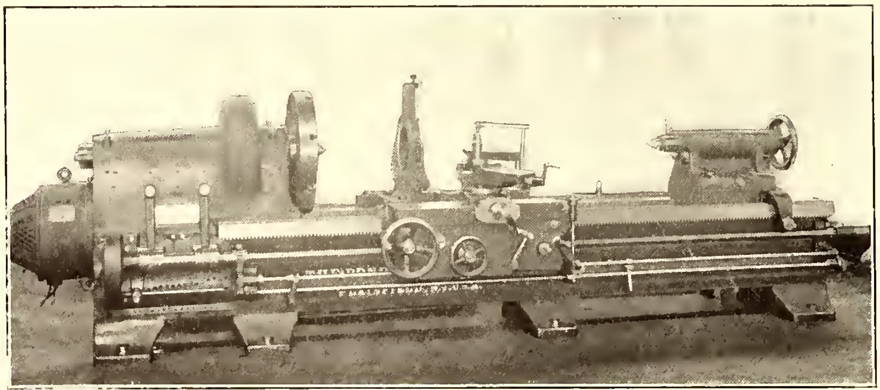
In another view is shown a similarly convenient arrangement of motor driving for a Pond steel-tired car-wheel lathe of the type which is so generally used for the truing of the rolled-steel and steel-tired wheels in railway service. The motor is here located at one end of the tool and in the position formerly occupied by the cone pulley. Owing to the fact that this tool is usually so mounted as to set below the level of the floor, the



ELECTRIC MOTOR DRIVING A STEEL-TIRED CAR WHEEL LATHE

motor comes below the general floor level, and is in practice covered up entirely by a false flooring, so that the source of driving is not only not obtrusive, but is not even in evidence, being entirely out of sight; this results in one of the most convenient and sightly driving arrangements that have ever been devised. The control of the motor is here, as in the case of the radial drill, vested in the controller, which is handily located for the workman at the middle point of the operating side of the tool, so that in almost no position upon the operating is he unable to reach the control handle; in this way it is really easy for the workman to closely watch the cutting tool, while stepping up the speed of cutting, and thus keep from damaging the tool.

Another interesting driving arrangement is illustrated in the remaining view, which illustrates a 30-in. Pond friction-clutch lathe, with a special type of headstock to accommodate the system of motor driving. According to the latest and best practice in motor driving for lathes, a proportionate part of the variable speeds is obtained in the motor itself, while the range thus obtained is greatly extended by the use of gearing changes between the motor and the spindle of the tool. This has been attempted in many instances, but never to so successful a degree as in the case of the tool herewith illustrated. The motor is here partially enclosed within the headstock frame work, all the driving connections being made inside, so that in addition to an excellent protection from dirt and other mechanical interferences from outside, the combination is both sightly and compact. Not only is the spindle driven through a friction-clutch connection, but also two changes of speed are available in the headstock gearing, which, multiplied by those to be had from the motor, make a total possible speed range of sixty different face-plate speeds. Those in the motor are, as in the other cases illustrated, readily secured by means of the rheostatic controller at the right-hand end of the bed, which is operated through the handle upon the right-hand end of the carriage; this is accomplished by means of the usual splined shaft construction, which permits the mechanism to operate at any position of the carriage upon the bed, and even while the carriage is in the act of traversing. By another and ingeniously arranged mechanism the two gear changes in the headstock are made from the carriage; here the control is also through a splined shaft so that a handle upon the apron operates the gear-change levers by means of a cam mechanism, as shown on the front of the headstock casing. Thus, as thirty-two feeds from ¼ in. to 1-64 in. are available through an improved type of feed-change mechanism, the tool is provided with a most flexible and convenient quota of speeds of driving and feeds, so that it is in itself adapted to all classes of machining work. It is, indeed, one of the most completely equipped tools for general work that has been produced. This lathe is driven by one of the new Westinghouse type-S machine-tool motors, which is designed for variable speeds by field control; the motor is especially arranged for bolting directly to the headstock frame, effecting thus a very material saving of both complication and expense in the mounting.

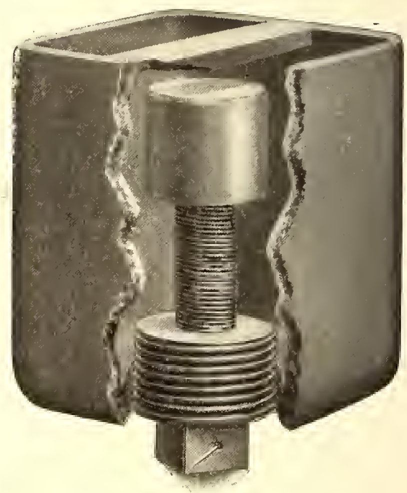


MOTOR-DRIVEN 30-IN. FRICTION-CLUTCH LATHE

The types of tools equipped as here illustrated are especially adapted for use in electric railway repair shops where electric current supply is always available. By the improvements here introduced a tool equipped as above shown may be set in any part of a shop, either temporarily or permanently, and by merely connecting the motor, through the proper fuses, to the trolley line current, is ready for operation; the advantages that the provision of such a full range of driving speeds, without the trouble of arranging line shafting or belting, will impose, are evident. The ease with which the tool may be moved to new and more convenient locations, also without necessity of expensive changes of line and countershafting, will also be readily apparent to all who have had this troublesome experience in shop practice.

A NEW OIL CUP

The Standard Automatic Lubricator Company, of Philadelphia, is putting upon the market with great success the new oil cup illustrated, which is radically different from its other oiler. This cup is a light rectangular casting of suitable shape to be conveniently fitted into the regular grease cup. No change or alteration whatever is required in the grease cup. There are no complicated parts, nor anything to get out of order, so that no adjusting is required. The cup is threaded at the bottom, into which a threaded plug is inserted, and in the upper end of this plug is secured a tight coiled spring, forming a series of valves. At the top of the spring is a weight which serves to increase the vibration when the car is in motion, opening the coils of the springs, thus enabling the oil to flow through the wick which is in the spring and extends down through the plug, the wick being held in place by a wire pin through the upper part of the plug. The oil is carried by the wick directly to the bearings, and when the car is at rest the spring assumes its normal condition, entirely shutting off the feed. There is no dripping, and the inconvenience of adjusting and attaching, as required by other oilers, is entirely avoided in this new device. The only attention the oilers require is to see that they are filled at stated times. The oiler is made in different sizes to fit any style of standard motors.

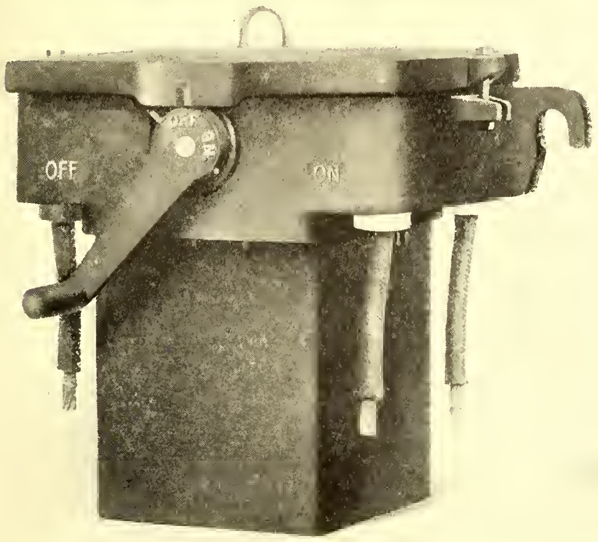


INTERIOR VIEW OF OIL CUP

OUTDOOR TYPE OIL SWITCH

The demand for a serviceable outdoor type of oil switch adapted for use with alternating-current series arc lighting systems for cutting out banks of transformers, isolating underground or overhead feeders and mains from main systems and operating inductive leads of all kinds, led the Westinghouse Electric & Manufacturing Company to design and place upon the market a switch that meets all these requirements. It is a double-pole, single-throw switch, mounted in a weatherproof case, which may be easily attached to poles or cross-arms in the case of overhead systems, or may be hung in manholes where underground systems are used.

The essential features consist of knife-blade contacts submerged in oil and high insulation between poles and between frame and live parts. Knife-blade contacts are used, as they insure the best contact for low temperature rise. Each jaw has a detachable arcing piece which takes the final break, thus preventing any possibility of arcing between the jaws and blades. These arcing pieces may be removed very easily when worn out or burnt away. Suitable barriers are placed between



OUTDOOR OIL SWITCH

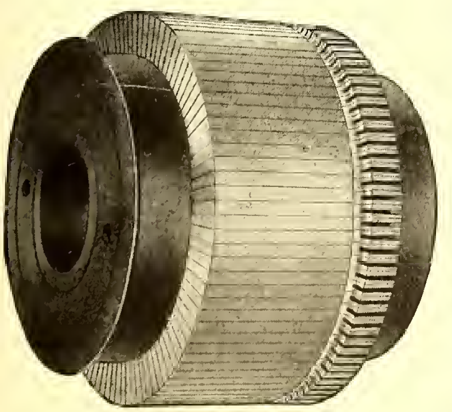
the poles, which prevent the arc from communicating. The switch is compact and light, weighing but 40 lbs.

When so ordered, a special oil may be furnished with this switch which is particularly suitable for use in cold weather, as it has a very much lower congealing point than any oil now on the market which is otherwise suitable for oil switch work. One and one-half gallons are required to fill the tank. The switch has a maximum capacity of 200 amps. at 3300 volts.

MERITS OF DIFFERENT TYPES OF COMMUTATOR SEGMENTS

Anent the discussion concerning the merits of drop-forged, hard-drawn and cast-copper commutator segments, it is very interesting to note the opinions on this vital subject of the Homer Commutator Company, of Cleveland, which claims the proud distinction of being the largest exclusively commutator builders in the world.

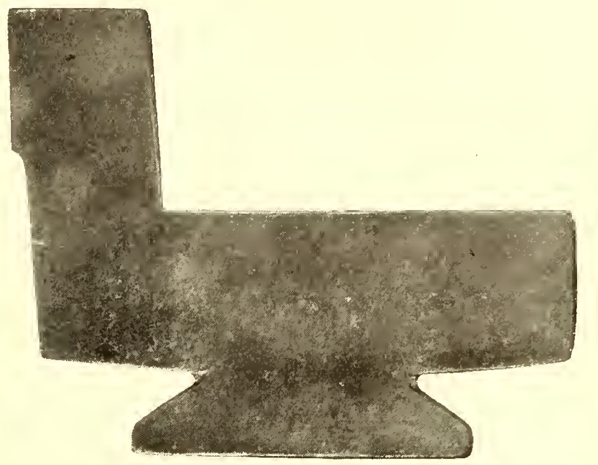
The company's experience has covered a period of fourteen years, and its deductions are consequently the cumulative results of the most careful observations during this entire period. The company feels that the style of commutator should determine the kind of segment. In renewing commutators with a head, such as are most widely made by the Westinghouse Electric & Manufacturing Company, the proper bar is drop-forged, since, without the slightest waste of time or material, a solid segment with head is formed, having the maximum conductivity.



COMPLETE COMMUTATOR

To produce such a bar in hard-drawn copper either the head must be riveted to each segment, with the always present possibility of an imperfect electrical connection, or, to be equivalent in effectiveness to a drop-forged bar, a segment must be drawn, often nearly twice the width of the segment proper. Then time and labor must be expended to cut these bars to shape, resulting in a loss of material also, which makes this process prohibitive, since, being no better, if as good as the drop-forged commutator, it must compete in price.

In contradistinction, the majority of the motors turned out by the General Electric Company have commutators of the headless type. In these commutators, if there is any virtue in



DROP-FORGED COMMUTATOR SEGMENT

the hard-drawn copper, it should be used here, and the Homer Commutator Company recommends and uses it upon such commutators.

Then there often comes an order for one special commutator. Manifestly, dies for so few segments to be drop-forged would be out of the question from the standpoint of expense, and it is equally true that the delay to have such a small quantity hard-drawn would also be impractical; consequently the only proper solution for prompt delivery and economy is to use the cast bar—not the ordinary commercial cast segment, but a correctly made and treated bar. The result will be a very effective commutator, and, in fact, commutators are made possible which would never be undertaken otherwise. There is, therefore, in the company's opinion a distinct and proper use for each of the three classes of commutator segments.

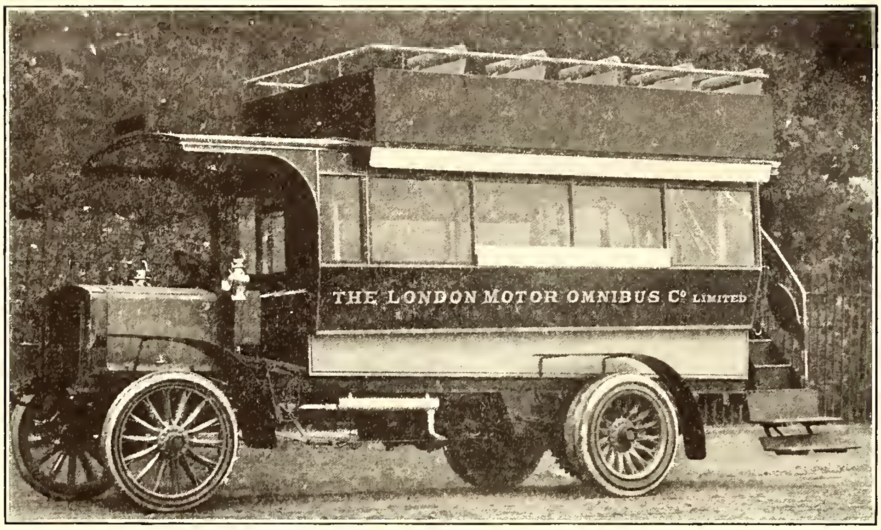
But if materials were the only problem, every maker could make the highest grade commutators, but a commutator is only begun when the correct materials are selected. It is the niceties of workmanship that make or mar the life and effectiveness of the product. Experts may never agree upon materials, because the difference is so slight and probably never actually measured, but the difference in workmanship is soon demonstrable in the increased life.

The immense number of commutators turned out by this company enables it to specialize its workmen, each man to produce a part or perform an operation which shall be as nearly uniform and mechanically perfect as human skill and machinery can make it.

The winner of the West Pennsylvania Railways Company's mileage guessing contest has been announced. He is H. F. Van Horn, a resident of Scottdale. His estimate was 196,412, while the actual number of miles was 198,176. The contest was confined to patrons of the company, and guesses had to be made on coupons cut from "Trolley Talk," the company's official publication. The prize was a book of tickets good for 100 rides on any line of the system.

MOTOR OMNIBUSES FOR RAILWAY FEEDERS

Motor omnibuses having during the last year or two proved of usefulness, it is now almost a necessity on the part of the practical railway manager to take these into consideration in various ways. Though it is not expected that they will ever run the electric railways off the streets, yet they have already proved themselves as valuable auxiliaries to tramways in collecting traffic from various outlying districts where it is not so dense as to warrant the great expense of laying permanent way. The big railroad companies also are finding them of use in various ways in collecting and distributing traffic from their stations. It may therefore prove interesting to describe two types of motor omnibuses operated by petrol engines, which are now being manufactured by John I. Thornycroft & Company, Ltd., at their new and extensive works at Basingstoke, England. The company's head office continues to be at Chiswick, London, where they have been known for so many years as engineers and shipbuilders.



DOUBLE-DECK GASOLINE OMNIBUS

The engine is of the usual internal combustion type, having four cylinders, the bore and stroke of which are 4¼ ins. and 5 ins. The cylinders are cast separately and have large aluminum covers on either side, thus enabling the water-jacket to be easily cleaned out if necessary. Both the inlet and exhaust valves are mechanically operated and are on opposite sides of the cylinders.

The ignition is of the magneto "make and break" type; a horizontal spindle having a reciprocating motion makes and breaks the connection on a nickel steel plug by means of a tappet. The spindle is actuated by means of an eccentric on the half-speed shaft. The magneto itself is gear driven from the cam shaft, this third shaft also acting as a pump spindle. The lubrication is forced to all moving parts by means of a pump in the base of the crank chamber.

The clutch, which is of the multiple-friction disc type, takes up very gradually without the slightest jar or jump; it is wholly encased and runs in a mixture of oil and paraffine. The carbureter is of the usual float-feed type, and has an arrangement whereby the mixture of air is automatically regulated.

The gearing, which provides four different speeds and a reverse, is entirely encased and runs in oil. The power is finally transmitted to the differential on the back axle by means of a Renold chain.

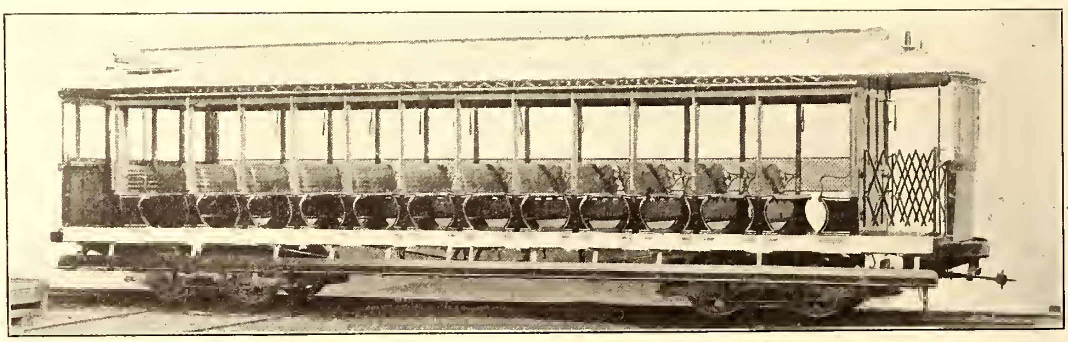
The Thornycroft spring drive is also employed, by means of which the drive is transmitted through springs to brackets bolted directly on the felloes, thus entirely obviating any strain on the nave or spokes. Solid rubber tires are used, twin tires being fitted to the driving wheels. The normal speed of this vehicle is 12 m.p.h.; it is capable of being accelerated up to 14 m.p.h., and on the bottom speed can throttle down to 3 m.p.h.

The usual type of body is a double-decker, carrying eighteen outside and sixteen inside, as shown in the illustration; it is suitable for towns and congested districts. The single-decker, which is capable of taking twenty-two passengers, is suitable for small towns and hotels, and, in cases where it is necessary, to carry passengers' luggage.

The cost of running a double-decked omnibus of the type specified herewith is about 22 cents per vehicle-mile; this charge is absolutely inclusive of all items (and is not merely the actual cost of running, such as gasoline, oil, grease and repairs)—depreciation, maintenance, wages, insurance and establishment charges are included in this figure, which has been found to be correct in cases where the vehicles are of sound construction and are properly looked after.

NARRAGANSETT CARS FOR NEW JERSEY & PENNSYLVANIA TRACTION COMPANY

The New Jersey & Pennsylvania Traction Company is about to place on its lines two 13-bench open cars of the Narragansett type built by the J. G. Brill Company. The builders lately furnished this company five of the semi-convertible cars which were described in the STREET RAILWAY JOURNAL of Jan. 28. The present order has some interesting features. The platforms are without the outside seats and passengers will be allowed to stand upon them. Portable vestibules are included, which, by protecting the motormen, increase their efficiency,



NARRAGANSETT TYPE CAR, WITHOUT PLATFORM SEATS, FOR THE NEW JERSEY & PENNSYLVANIA TRACTION COMPANY

and also are for the protection of passengers standing on the platforms. At present the cars will be run in one direction; therefore, the running board is only placed on one side; the other side, however, is arranged so that the running board may be attached to it at any time. The net-guard, which may be seen in the illustration, is screwed to the posts and will be used as long as the cars are run in one direction, and when removed, guard rails will take its place. The advantages of this type of car, providing a double step within the limits of width of a single-step car by means of Z-bar sills, with the upper step on the outwardly extending lower flange of the sills, are well known, and therefore need not be enlarged upon. The seating capacity is forty-five, and loading and unloading is rapidly and safely accomplished by the type of steps. The car being narrow in width, is capable of operation upon the street of Trenton.

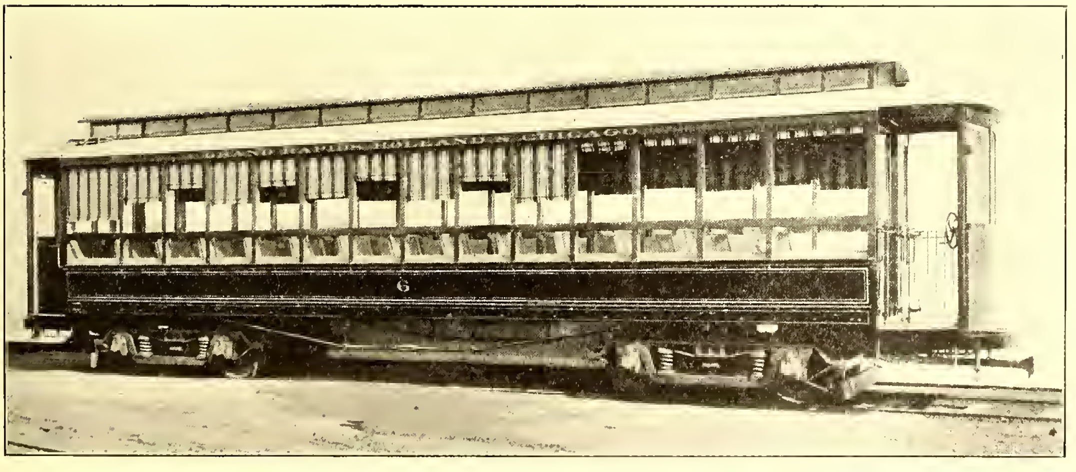
The cars are 40 ft. 4⅜ ins. over the crown pieces and 8 ft. wide over the sills; center of corner posts over crown piece, 4 ft.; width over the posts at belt, 8 ft. 10 ins.; sweep of the posts, 5 ins.; side sill size (Z-bars), 8 ins. x 3 ins. x ½ in.; thickness of the corner post, 3⅝ ins., and of the side post, 2¾ ins. The cars are mounted upon No. 27-G trucks, for fast and heavy city and suburban service.

OPEN INTERURBAN CARS FOR GRAND RAPIDS

The American Car Company has lately delivered to the Grand Rapids, Holland & Chicago Railway six motor cars of an interesting design. The cars will be operated on an interurban line at a high speed, which necessitates the low panels at the sides, while wooden guards prevent the passengers from leaning out. No sash are used, but curtains reach from the ceilings to the paneled portion, and the edges extend into deep grooves in the posts, so that when down, the passengers are assured of complete protection. The seats, with the exception of two at each end of car, have reversible backs and are 33 ins. long, leaving an aisle width of 21 ins. The seating capacity is sixty. The interior finish is of ash and the ceilings are of varnished carline finish.

The railway company now operates about forty-six cars on its 40 miles of track. The large amount of summer traffic occasioned by the popularity of several amusement resorts included in the system has made it necessary to order extra equipment suited to this service. The large seating and standing capacity of the cars, and the safety with which they may be operated at a high speed, adapts the type admirably to the purpose. The illustration shows the car mounted on M. C. B. trucks, upon which it was placed temporarily. All of the cars are to be mounted on Brill No. 27-E trucks.

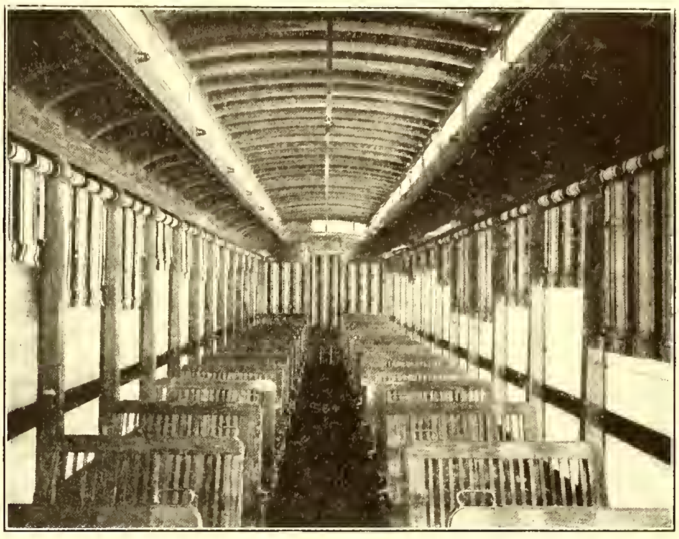
The general dimensions of the cars are as follows: Length over the corner posts, 37 ft. 4 ins., and over the bumpers, 46 ft.; from the panel over the crown piece, 3 ft. 6 ins.; width over the sills, 7 ft. 8 ins.; width over the posts at the belt, 8 ft.; sweep of the posts, 2 ins.; distance between the centers of the posts, 2 ft. 6 ins.; side sill size, 4½ ins. x 6¾ ins.; end sill size, 4¾ ins. x 6¾ ins.; sill plates, ⅝ in. x 7 ins.; thickness of the corner posts, 3¾ ins., and of the side posts, 2¾ ins.; length of the seats, 33 ins.; width of the aisles, 21 ins. The equipment includes Brill angle-iron bumpers, "Dedenda" gongs, channel-iron draw-bars, signal bells and steps, and the American Car Company's sand boxes and vertical brake wheels.



HIGH-SPEED INTERURBAN CAR USED ON THE GRAND RAPIDS, HOLLAND & CHICAGO RAILWAY

COMBINED CORN-POPPING AND PEANUT-ROASTING MACHINE FOR PARK SERVICE

Although a machine for popping corn or roasting peanuts can hardly be classed as an amusement device, there is no good reason why a park manager should not insist upon having the most attractive machines procurable, since their use will certainly increase the profits from such popular park standbys as popcorn and peanuts. Along these lines the Kingery Manufacturing Company, of Cincinnati, Ohio, has designed its No. 60 machine, a very neat and interesting hand-power combination for popping corn and roasting peanuts. Its capacity for popping corn is 4 bushels an hour. With each revolution of the cylinder the popped corn is separated from the unpopped corn and ejected. No breaking occurs during ejection, as the corn is rolled out, not shaken. The screening is very thorough, leaving no hard grains in the fritters, bricks or balls. When intended to use the machine for peanut roasting, the popping cylinder can be quickly removed and replaced by the peanut roasting cylinder. The latter has a capacity of half a bushel. The case has a shelf for the display of the stacked peanuts, and the heat from the popper is amply sufficient to keep them warm.



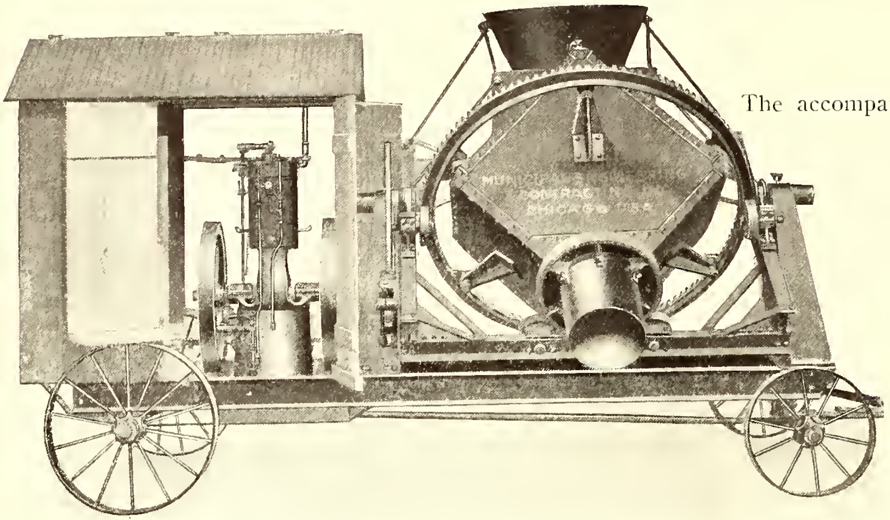
AN INTERIOR VIEW OF THE GRAND RAPIDS CAR

This device is portable, being attached to a wagon which is mounted on steel springs, steel axles and steel-tired wheels, 24 ins. in diameter. The other dimensions are: Length, 63 ins.; width, 34½ ins.; height to the top of the case, 63½ ins. The shipping weight of the case is 225 lbs., and of the wagon alone, 62 lbs.

This company also makes a large variety of other devices, such as ice-cream freezers, milk shakers, ice-cream tubs, cabinets, ice breakers, ice shavers, etc.

CUBICAL TYPE CONCRETE MIXER

Considering the amount of concrete work that is done by street railway companies throughout the world, it is a surprising fact that very few machine mixers are seen upon street railway work. Nearly all the concrete is mixed by hand by gangs of men under the supervision of some foreman who very often knows very little about concrete. Machines have been noticed in very few places, but where they were used the cost of mixing the concrete was brought down to about one-fourth



CUBICAL TYPE CONCRETE MIXER

or one-fifth the cost of mixing by hand, and concrete was made better in every way. Ordinary concrete will very seldom stand a compressive strain of over 800 lbs to 1000 lbs. to the square inch, but machine-mixed concrete, provided it is mixed in the right kind of a machine, will stand a compressive strain of from 4000 lbs. to 5000 lbs. per square inch.

It makes very little difference what proportions are used in mixing concrete so long as the mixing is thorough and all the materials are proportionately distributed through the mass, so that every particle of sand and gravel is coated with wet cement mortar, and in this way cemented together. A mixture wherein a large proportion of cement is used as compared with the other aggregates, is liable to be a trifle more water tight than where the proportion of cement is lower.

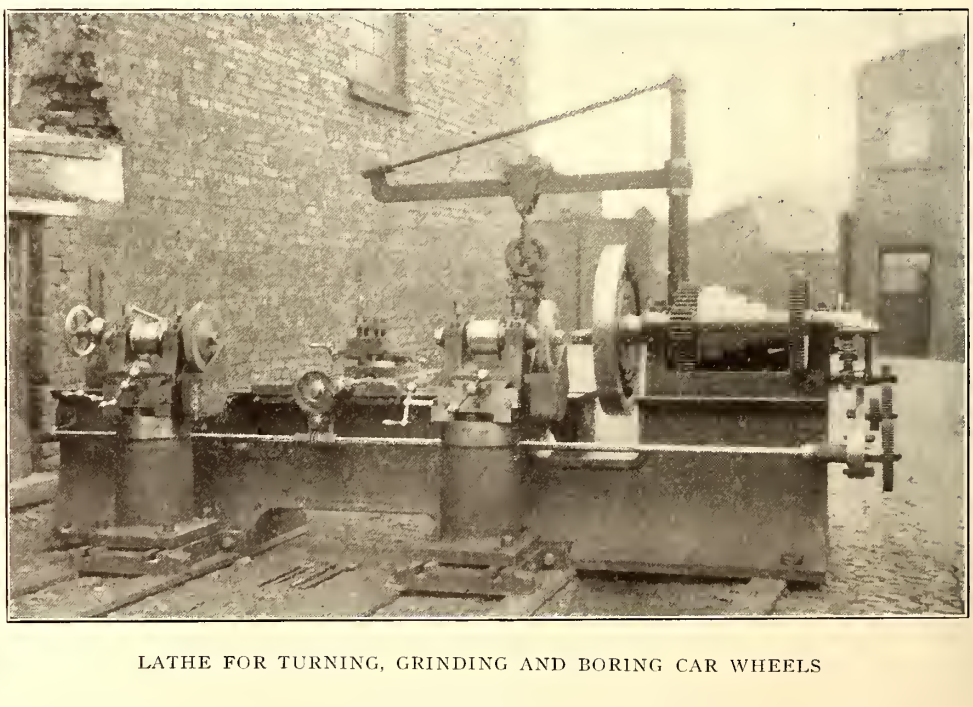
A very neat outfit for street railway work consists of a mixer mounted on trucks, with engine and boiler complete, or with gasoline engine. There are many forms of machines in the market as concrete mixers, but the preference expressed by a large number of engineers and architects and scientific men is for the cubical mixer revolving on a diagonal axis. Since it has been on the market in the form shown in the accompanying illustration its popularity has greatly increased among all classes of concrete users. The United States Government uses a number of these mixers, which are made by the Municipal Engineering & Contracting Company, of Chicago, and it is claimed by the engineers in charge of the work that the average time of turning out a batch is about one minute and twenty seconds. This covers the operations of loading, mixing and discharging.

This form of concrete mixer is rapidly coming to the front, for it adds to the well-known advantages of the cube those obtained by rapid methods of loading, revolving and discharging the finished concrete. It has no insides and is a self-cleansing mixer in every sense of the word. It never has to be pounded and the inside of the cube never has to be scraped. There are no deflectors or paddles or any form of interior mechanism to clog and become coated with mortar.

NEW WHEEL LATHE

The accompanying illustration shows a type of car wheel turning, grinding and boring lathe which has been designed by Pollock & Macnab, Ltd., of Bredbury, Manchester, for the special use of railways. The machine is made in three sizes and will grind the rims of two wheels at the same time. It will also bore the wheel bosses, do ordinary lathe work and will turn the rim of two wheels, with shrunk tires, both at the same time. The bed of the machine is of rigid design, and has a headstock with a four-speed cone, the gears being cut from solid blanks. The carriage and slide rest, with a special reversing and self-acting feed motion, can be used for general purposes or for boring and truing wheel bosses. It will grind tramway wheels from 18 ins. to 34 ins. in diameter, 4 ft. 8½ ins. in gage or in other ordinary tramway gage.

A crane is supplied with this machine, and is arranged to give enough head room to lift the axle shaft and to clear the head rests, a pair of pulley blocks being also supplied with the crane. For any of the operations, either turning or grinding, no movement or change of parts is required, so that the machine is already coupled up for any of the operations, which



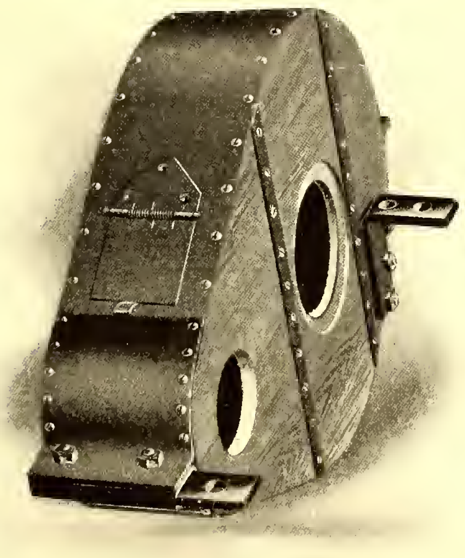
LATHE FOR TURNING, GRINDING AND BORING CAR WHEELS

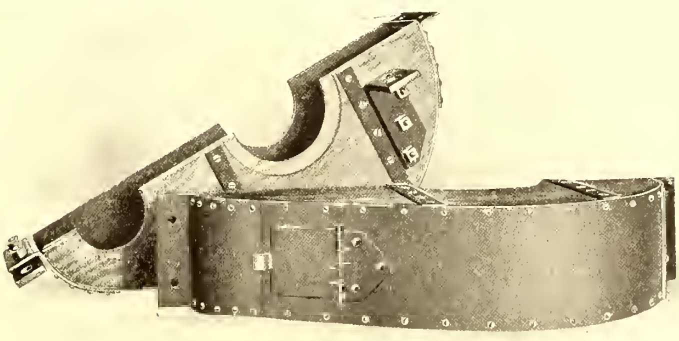
is a great advantage, as frequent changes from turning to grinding are required. The machine has the advantage that it cannot readily become obsolete, as it is entirely suitable for either grinding chilled-iron wheels or shrunk-steel tires, and thus fulfils the wants of the tramway manager for the present, whether he is an advocate of the chilled wheel or the steel-tired wheel.

COMBINATION STEEL AND WOOD GEAR CASE

During the past few years many electric railways have experienced such exasperating delays in getting malleable-iron gear cases, and often had such unsatisfactory results from them when received, that they will doubtless be interested to learn that the E. W. Bliss Company, Brooklyn, N. Y., designs and builds a very effective and satisfactory substitute, known as the "Bliss combination steel and wood gear case." The accompanying views give a very good idea of this case, Fig. 1 showing the gear case assembled, and Fig. 2 the two halves prior to assembling.

This style of gear case has many advantages over others heretofore placed on the market. The supporting lugs on the malleable-iron case are very easily broken, thereby making the case useless; in the combination case this difficulty is overcome, as the lugs are of wrought steel. Experience has shown that when the combination gear case comes in contact with a heavier substance, the sides, being made of wood, give way on the lower half without delaying the car, instead of becoming wedged under the car, as frequently happens with malleable-iron cases, often necessitating the jacking up of the car before the case can be removed and the car allowed to proceed. The arrangement of this case is such that it is least liable to damage or break the gear or pinion. Its weight is about one-third as much as a malleable-iron case, and it is much cheaper.





FIGS. 1 AND 2.—ASSEMBLY AND PARTS OF COMBINATION STEEL AND WOOD GEAR CASE

Beginning May 10 the Aurora, Elgin & Chicago Railway Company announces that it will start a parlor and buffet car service on the train leaving its Fifth Avenue terminal in Chicago every day at 1 p. m. This service will be for the benefit of members of the various golf clubs at Wheaton and such travelers as may wish to patronize a parlor and buffet car on the way to Aurora.

GASOLINE MOTOR-OMNIBUS

The Great Western Railway Company of England has recently purchased the single-deck motor omnibus shown in the accompanying illustration from the Wolseley Tool & Motor Car Company, Ltd., of Birmingham. As will be observed, the body is of the single-deck type and has double seats in front to accommodate passengers who prefer traveling outside. It seats altogether twenty-two passengers, sixteen inside and six in front, two being beside the driver. The top is extended right over the driver and provided with a luggage rail. The chassis is the standard 10-ft. or 12-ft. wheel base for omnibuses, and is 16 ft. 6 ins. long, and the track is 6 ft. 2 ins., the over all width being 7 ft. 2 ins. The frame is of pressed steel, the height from the ground to the top of the frame being 31 ins. The wheels are of the artillery pattern, having the front pair 34 ins. in diameter and the back 42 ins.

GASOLINE MOTOR OMNIBUS FOR THE GREAT WESTERN RAILWAY

The engine is of the horizontal two-cylinder type, the cylinders being 6 ins. in diameter by 7-in. stroke, developing 20 bhp at 600 r. p. m., and fitted with half-compression cams to ease the starting. No governor is fitted, the engine being controlled by a hand throttle on the steering column and a foot throttle in connection with the brake pedal. The carbureter is of the "Wolseley" compensated type and electric high-tension ignition is used by means of accumulators and induction coil. A "Renold" silent chain is used for the drive to the gear box, which is suspended from three points, and contains all the gearing in one grease-tight box. The gears are of the sliding type, and give normally four forward speeds of 2½ m.p.h., 5 m.p.h., 8 m.p.h. and 13 m.p.h., respectively, and one reverse speed of 5 m.p.h.

The omnibus is fitted with three independent sets of brakes, all being of the metal to metal type, which act equally well in both directions. The rear axle is formed of a weldless steel tube, and the front axle is forged in one piece. The steering is irreversible, being operated through a worm and sector, the worm being on the lower end of the inclined pillar. The gasoline tank has a capacity of 12 gals., and the gasoline consumption of the omnibus averages about 1¼ gals. per hour under ordinary conditions.

The foregoing illustration shows one of the omnibuses recently tested on a trial run at Lichfield. The route selected was about 60 miles long, and gave ample opportunity for testing the 'bus, both for speed on the level and for hill climbing. Though the weather was very wet and windy, the whole trial was carried out exactly at the schedule times which had been arranged for at the various stopping places. It is interesting to note that the Wolseley Company has in course of erection at the present time, in its large shops recently put in operation, a very large number of public service vehicles for the London General Omnibus Company, the Birmingham Motor Express Company, Ltd., and other leading companies requiring motor omnibuses, in addition to various corporations which are giving them a trial in conjunction with their already existing tramways.

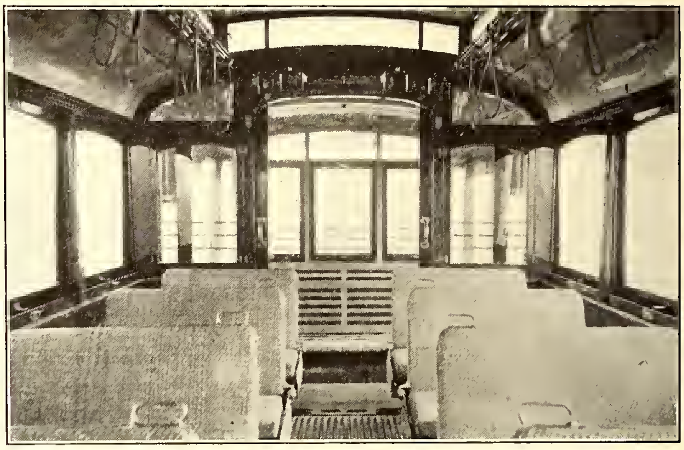
NEW SCOTCH TRAMWAY

The power to construct and work the Dundee Broughty Ferry & District Tramways was obtained by the Dundee Broughty Ferry & District Tramways Company under the private Legislature procedure (Scotland), act 1899, receiving royal assent in August, 1904. J. W. Speight is consulting engineer. The contract, which was obtained by J. G. White & Company, Ltd., of London, includes the complete construction and equipment of the permanent way, overhead line, power house, car sheds, cables, etc. The contract price is £88,250. There are 5⅓ miles of route, equivalent to 9⅔ miles single track. The gage is standard. The rails are British standard No. 1, 45 ft. long, fitted with continuous rail-joint and intermediate anchors. The switches are 10 ft. 6 ins., having a radius of 100 ft. The crossings are iron bound. One mile of the track will run on a new road through the Craigie and Home estates. This portion of the track will be laid with the usual 6-in. bed of concrete, and paved with tar macadam and granite edging. The bridge over the Dighty will be widened. The overhead construction will consist mostly of bracket arms. There will be double trolley wire, No. 00 B. & S.; height from the ground, 21 ft. The cables are to be laid on the solid system. The power house will be a brick building with a chimney shaft of 110 ft. The plant will consist of two 200-kw railway generators with high-speed engines. There will be three Lancashire boilers, superheaters and the usual condensing plant. The car shed will be a brick building 176 ft. long and 45 ft. wide. The tracks in the car shed will consist of vignole rails laid on sleepers. There will be twelve single-truck, double-decked cars fitted with two 37-hp motors.

R. H. Derrah, general passenger agent of the Boston & Northern and the Old Colony Street Railway companies, has extended an invitation to the members of the Newspaper Club of Boston to join a trolley party to be given to the club on Sunday, May 14. The start will be made from North Station, Boston, at 9 a. m., and the trip will include Gloucester and other Cape Ann points. A well-stocked buffet goes with the trip.

CALIFORNIA TYPE OF CAR FOR FREMANTLE, AUSTRALIA

The J. G. Brill Company is shipping fourteen of its California cars to the Fremantle Municipal Tramways, Australia. The California car is an ideal type for service at Fremantle, where, for a large part of the year, the temperature varies greatly during the day. Thus, in the heat of midday, the passengers may sit in the open sections of the cars and enjoy the refreshing sea breezes, having the bulkheads as a protection from the strong drafts, while later in the afternoon, when it becomes cooler, or in the evening, the closed compartment affords shelter for those who prefer more complete protection.



VIEW OF INTERIOR OF COMBINED OPEN AND CLOSED CAR FOR FREMANTLE TRAMWAYS

Fremantle, of about 15,000 inhabitants, with its wonderfully arranged artificial harbor, capable of receiving all steamers that pass through the Suez Canal, and being touched regularly by several of the large mail lines; its large and substantial prison buildings, formerly convict barracks; its smelting factory, where gold from Coolgardie, Kalgoorlie and Boulder is worked into bullion; its great warehouses, comfortable and ornamental hotels, and numerous churches and schools, is one of the most interesting in all Australia. Holding, as it does, the key to Western Australia, and commanding an extensive floating as well as settled population, Fremantle is steadily and consistently growing.

CALIFORNIA TYPE OF CAR FOR THE FREMANTLE MUNICIPAL TRAMWAYS

The closed compartment of the cars to be used in this city is 11 ft. 6 ins. over the end panels, and is attractively finished in cherry, stained mahogany and highly polished. The ceilings are of decorated bird's-eye maple. The cars are 28 ft. 4 ins. over the crown pieces and 8 ft. 5 ins. from end panels of closed compartment over crown pieces. The width over the sills is 7 ft. 9½ ins. in the closed compartment and 6 ft. 11¾ ins. in the open compartment. The width over the posts is 8 ft. 4 ins. in the closed and 7 ft. 10 ins. in the open sections. The sweep of the posts is 3¼ ins. in the closed and 5 ins. in the open compartments. The side sills are 4¼ ins. x 5 ins., and the end sills, 5¾ ins. x 5 ins. The corner posts are 3⅝ ins. thick, and the side posts, 2¼ ins. thick. Thirty-four passengers may be comfortably seated.

The long dropped platforms are supported without strain to the body by a pair of angle irons, with the upper flange under the sills of the body, and offset and prolonged to carry the platform, a cantilever arrangement, which adds greatly to the strength of the car. This is a special feature of this builder which has had much to do with the success of this type of car, making it very strong and capable of carrying large loads without strain to the upper structure. It will be noticed that the seating arrangement provides for considerably more passengers than a standard closed car with longitudinal seats of same length over the crown pieces. Curtains are provided for the open compartments. The spring cane seats in the closed compartment are placed transversely, and two of the slat seats in the open sections have reversible backs. The cars are mounted on No. 21-E trucks with 6-ft. 6-in. wheel bases and 33-in. wheels. Among the Brill specialties included in the furnishings are angle-iron bumpers, radial draw-bars, "Dedenda" gongs, ratchet brake handles and sand boxes.

"THE BUMPS"

The amusing novelty for pleasure parks, designed by Edward C. Boyce, of New York, and known as "The Bumps," originally consisted of a smooth slide about 50 ft. in length, with polished maple bumps of different sizes, placed at regular intervals on its surface. These bumps serve to change the direction of the slider and to give him a series of quick bumps which would land him at the bottom on a soft pad or cushion in a more or less reckless and excited condition. This year, in constructing a number of "Bumps," the originator of this amusement has added, in addition to the main slide, three others, as shown in the accompanying illustration; one, a straight and narrow chute constructed of slippery basket work

A VIEW OF "THE BUMPS"

material, which gives the slider an excellent speed; another, producing a sensation of alternate falling and rising until the bottom is reached by a succession of general inclines; and a third, which is perhaps the most exciting of all, consists of a narrow chute with sharp and narrow turns occurring at the most unexpected places.

The success attained by the original "Bumps" as an attraction should be largely increased by the addition of these improvements. It strongly recommends itself to the amusement manager, not only for its money-making qualities, but also on account of the low cost of construction and attendance, only one person, acting in the capacity of cashier, being required to look after it.

SHOP KINKS FROM DUBUQUE, IOWA

Delegates to the Iowa Street and Interurban Railway Association convention at Dubuque had an opportunity to inspect the new shop and car house of the Union Electric Company. The principal repair track of the shop is equipped with apparatus for hoisting car bodies, made by the Pittsburg Machine Tool Company. This apparatus is similar in its operation to that used in the large shops of the St. Louis Transit Company. A motor is geared to four jack screws, two of which are located on each side of the track. These raise and lower a pair of I-beams running parallel with the tracks, and by placing cross-beams under the car resting on the I-beams, any length of car can be raised and lowered. The apparatus is simple and is absolutely safe, besides being very quick in operation.

The machine shop contains motor-driven tools, and these machine tools are located handy to the repair tracks, with no partition between, so that the machine work is all done in the main repair room. The blacksmith work is done in the boiler room in the rear of the repair house. The armature winding is also done in a separate room, and a simple form of oven is in use for baking armatures. This oven is heated with fifteen common 16-cp incandescent lamps, which, while possibly not as efficient as heaters as they might be, are more convenient to install and renew, and the total amount of current required is not enough to make it necessary tediously to figure the efficiency. The box is lined with asbestos and covered with sheet steel.

The shops are heated with steam coils located overhead, and, contrary to some experiences elsewhere, there has been no difficulty in keeping the main shops comfortable in cold weather. In the paint shop, however, which is a smaller room, the results were not satisfactory until a small motor was put in, driving a fan blower, which draws in air near the floor and forces it up through a wooden flue to a point near the steam coils overhead. This forced circulation makes it possible to heat the room easily.

After his daughter, a fourteen-year-old girl, and a Sunday-school pupil, had been awarded judgment for $6,500 against the Louisville Railway Company, John R. Owens filed an affidavit that his daughter was not entitled to a cent; that so far as he knows she is only suffering from sciatic rheumatism, and that he had not heard of the street car accident until after she became ill, when the accident was suggested as a possible cause of the rheumatism. The matter has so preyed upon Mr. Owens' mind that he felt it his duty to go to some one connected with the company and tell the facts set out in the affidavit. The accident is said to have occurred in February, 1904, though the affidavit alleges that the girl went to school every day and Sunday-school from Jan. 1, 1904, until about April 13 last. Then she suffered from sciatic rheumatism for four months. Mr. Owens says that as father of the child he refused to bring the suit because he knows exactly what is the matter with his daughter. The suit was brought in the name of Fannie Owens, the elder sister of the girl, and the original demand was for $15,000 damages. From the first the Louisville Railway Company maintained that the Owens girl had never been injured in an accident on its lines. The girl appeared on crutches in court.

THE EXHIBIT OF RAILWAY APPLIANCES AT WASHINGTON

The exhibit of railway appliances now being held in Washington in connection with the International Railway Congress, now in session, is the most elaborate of the kind ever held in this country. Through a special act of Congress the right was secured to use for this purpose a portion of the Washington Monument grounds on Fourteenth, Fifteenth and Sixteenth Streets near B Street. This is within three blocks of the headquarters of the Congress, at the New Willard Hotel. In addition to the main exhibit building on Sixteenth Street, which is 160 ft. x 200 ft., and which accommodates about 200 exhibitors, a number of manufacturers have erected individual booths. Particulars of some of the more important exhibits follow:

The Westinghouse Building at Washington is the largest structure on the grounds, apart from the headquarters building devoted to the grouped displays of the smaller exhibitions, and presents in an attractive and orderly arrangement the most remarkable combination of Westinghouse products ever brought together under a single roof. The brake and coupler appliances of the Westinghouse Air Brake Company and its associated interests are shown under conditions approximating those of actual practice; the Union Switch & Signal Company has installed full-size safety apparatus of all standard types; the Westinghouse Electric & Manufacturing Company exhibits for the first time complete operative equipments of its latest form of multiple control systems for alternating current and direct-curren traction, with important auxiliary sub-station apparatus, and displays also an interesting collection of heavy railroad shop tools driven with Westinghouse motors; the Westinghouse Machine Company has set up, open for inspection, a 600-hp steam turbine identical in size and type with the Westinghouse turbine that ran continuously for 3962 hours at the St. Louis Fair; and Nernst lamps and Cooper Hewitt lamps peculiarly adaptable, respectively, for decorative passenger station and train illumination, or for economical terminal shed and tool shop lighting, are used liberally throughout. The dome of the building is lighted with four big electric signs which flash the name Westinghouse to a great distance, and large banners at the entrances carry the names of the twenty-six Westinghouse companies of the United States and Europe represented in the joint display. Frank S. Smith, one of the resident Westinghouse commissioners at the Louisiana Purchase Exposition, is the managing director, and C. W. Townsend is in immediate charge of the installations of the Air Brake Company. A detailed description of the more important exhibits will be published in the next issue.

The Robins Conveying Belt Company, of New York, has an exhibit of its coal-handling machinery, which is very similar to that shown at the St. Louis Fair last summer. Three conveyors are shown, viz.: One 16-in. wide x 27-ft. centers, one 16-in. wide x 26-ft. centers, and one 16-in. x 45-ft. centers. All run at a speed of about 200 ft. per minute and require 5 hp to drive them. The first conveyor is equipped with one of the company's automatic self-reversing trippers. The conveyors are in operation, and the material is automatically distributed into the hopper by means of the tripper just mentioned. From this hopper it is discharged upon conveyor No. 2, which elevates, conveys and discharges it into the chute which delivers to conveyor No. 3. Conveyor No. 3 carries the material to a chute which takes the place of the weighing device, and which in turn discharges on to the tripper line. The principal points of interest in this installation are as follows: The automatic self-reversing tripper for the purpose of distributing the material in a long line of bins situated along the horizontal run of a conveyor. The ability of the conveyors to carry material at a considerable upward inclination, and the very light structures needed to support the machinery. Conveyors Nos. 2 and 3 run at an upward inclination of about 20½ degs.

The Sherwin-Williams Company has a booth in Section C, Nos. 28 and 29, which it offers more as a resting place for the delegates than for any advertising purpose. The company has an electric sign, which will be shown from the top of the Johnson House, which is some 40 ft. long by 20 ft. high, using over 600 lamps in the lighting of the same. Other than a few pyramids of paint cans and an enlarged picture of its plant the company shows nothing whatever.

The Standard Paint Company's exhibit at the American Railway Appliance Exhibition at Washington consists principally of a reproduction of the Pennsylvania Railroad round-houses at Chicago, which are covered with Ruberoid roofing. This building is complete in every particular, 14 ft. long by 7 ft. deep. It is intended by this exhibit to demonstrate the utility of Ruberoid roofing as a covering for railroad round-houses. In addition the company has at Washington exhibit models of refrigerator cars, showing the application of Ruberoid car roofing and of Giant insulating papers. There are also models of steel dump-cars, showing the application of Flexite, the company's paint for these cars, and a model bridge to suggest the use of Standard Paint Company's colored paints for bridge work and general structural iron work. The Standard Paint Company has gone extensively into the field of colored preservative paints and is making a striking demonstration at Washington.

The Peerless Rubber Manufacturing Company's exhibit consists of a full line of high-grade mechanical rubber goods for railway purposes, including air brakes, steam, suction and hot-water tank and washout hose, rubber belting; a full line of packings, including "Rainbow" sheet and flange packing and "Peerless" piston and valve rod packing; tubing for pneumatic tools, mats, matting, sheet tiling, etc.

The exhibit of the Standard Steel Works, of Philadelphia, consists of steel-tired wheels, forged and rolled steel wheels, steel tires, railway springs and various test specimens and sections showing the superior character of the company's manufacture. This company enjoys an enviable reputation for advanced methods of manufacture. At the Columbian Exposition it received an award for "A novel and excellent process of manufacture from the ingot to the finished tire," referring to the use of billets cut from long ingots after the upper and segregated part has been rejected, thus insuring absolutely solid material. This process has now also been adopted in the preparation of blanks from which the forged and rolled steel wheels are made. These wheels, by the way, are a new and most interesting feature in railway equipment, and will justify close examination and trial. Made as they are, from solid steel blanks of the hardness of tire steel, and exhibiting high physical qualities, they should be found adaptable to many kinds of railway service, both steam and electric, where the steel-tired wheels are possibly too expensive. This company has for many years been prominent in the manufacture and sale of steel-tired wheels, which are made with centers of either cast steel, cast iron or wrought iron, and with any method of fastening desired. It has also a new and thoroughly equipped department for making railway springs, and its forge for making steel and iron locomotive forgings is one of the largest in the country. Besides the varied products briefly mentioned, it produces about 3000 tons of iron castings and 1000 tons of steel castings per month.

The Pantasote Company, of New York, is exhibiting a section of a palace car, demonstrating in a particular way the different uses of Pantasote fabrics as they are used in railroad coaches. The car is equipped with Pantasote curtains, and the seats are upholstered with Pantasote leather. Outside of this car the company is exhibiting other seats and curtain frames.

The American Locomotive Company's exhibit consists of one class 38-16-2½ steam shovel, and one New York Central consolidation locomotive with Walschaert valve gear, cylinders 23 ins. x 32 ins., total weight of locomotive 223,000 lbs., total weight of locomotive and tender 366,000 lbs. in working order, tractive power 45,685 lbs.

The Carnegie Steel Company has on exhibition a steel cross tie and steel rail-joint. The company is having a pamphlet prepared illustrating the tie and joint.

The National Battery Company, of Buffalo, N. Y., has no exhibit of its own, but supplied batteries to the Chicago Pneumatic Tool Company and the General Railway Signal Company for service in connection with their exhibits.

The Lorain Steel Company occupies Section W in the Main Building, and its exhibit includes sample sections of some hundred different types of rails which have been rolled and furnished for the many roads in various foreign countries as well as those in use by all the prominent roads in this country. Among the several frogs, switches, mates and crossings shown, for both foreign and domestic use, of the well-known guarantee hard-center type of construction, two deserve special mention. One is a newly designed 9-in. guarantee frog with the quick release hard-center plate. In this the arms are of rolled steel rail fitted into a cast-steel box of unique design, and after being inserted and securely held by rivets, cast iron is poured, filling all the space between the rolled rail and the casting, thus embodying the maximum strength and durability with the minimum area of metal exposed in the street. This type of construction is also being used in the manufacture of switches and mates. The other is a quarter section of the company's special type of hard-center steam railroad crossing, which shows striking advances in the manufacture of this class of work. The track welding department also exhibits samples of electric track welding.

The Rand Drill Company, of New York, has a booth on Plot 5 containing a complete air plant, consisting of air compressors, rock drills, Imperial pneumatic riveters, chippers, piston air drills, hoists, air motors, plug and feather drills, carving tools, core drills, etc.

The Duff Manufacturing Company, of Allegheny, Pa., has a large exhibit in Section F, Space Nos. 7 and 10. The company shows a complete line of Barrett track and car jacks, Barrett geared ratchet lever jacks, and the new Duff roller-bearing ratchet screw jacks. This is the first time these Duff roller-bearing jacks have been exhibited, as they are just being placed on the market, and there are a large number of sizes, with capacities from 15 tons to 70 tons. These roller-bearing jacks are said to be far superior to any other kind of anti-friction jack, inasmuch as the bearing will stand much heavier loads, will wear better and last longer, and is much more economical. The company has three jacks designed for all kinds of service, and has gone to a great deal of expense and time to have them properly designed and proportioned. The company also shows a section of track, which will be properly ballasted, and upon which will operate several Barrett track jacks in order to demonstrate how the track jacks are used in track construction and repair work.

The Wheel-Truing Brake-Shoe Company, of Detroit, Mich., exhibits samples of a few of the many different styles of brake-shoes which it manufactures, such as shoes for dressing down tread-worn wheels, for truing up flat wheels, for operating upon long flanges, and for use upon chilled iron as well as steel wheels. The samples are all fully nickeled, but are regular sized shoes taken from stock. The company is represented by J. M. Griffin, president and general manager, and O. P. Allen, superintendent.

Heywood Brothers & Wakefield Company, of Wakefield, Mass., has on exhibition eight sets, four being of types used for regular steam railroad equipment and four being such as are used for electric, interurban or narrow-gage cars. In the first class there will be: A. Slideover-back car seat, Wheeler patent, 41 ins. long over all, upholstered in brown star frieze plush, mahogany arm rest. This seat is standard upon the lines of the Pennsylvania system. B. Slideover-back car seat, Wheeler patent, 41 ins. long over all, upholstered in maroon leather, mahogany arm rest, high three-part back, pedestal base and adjustable foot rest. C. Turnover back car seat, Pottier & Stymus patent, 41 ins. over all, upholstered in rattan, iron end with nickeled arm cap. D. Turnover-back car seat, Pottier & Stymus patent, 41 ins. long over all, upholstered in royal blue star frieze plush, cherry arm rest. The seats for the electric railway and narrow-gage equipment include: A. Slideover-back car seat, Wheeler patent, 38 ins. long over all, upholstered in green frieze plush, high three-part back, bronze back band, quartered oak arm rest, pedestal base and adjustable foot rest. B. Slideover-back car seat, Wheeler patent, 35 ins. long over all, upholstered in dark green leather, high headroll back, Wakefield grip handle, pedestal base and adjustable foot rest. C. Slideover-back car seat, Wheeler patent, 34 ins. long over all, upholstered in rattan, Wakefield grip handle. D. Slideover back-car seat, Wheeler patent, 34 ins. long over all, cherry slat cushion and back.

The Consolidated Car Heating Company, of Albany, N. Y., has on exhibition a complete line of couplers, traps, valves, drums, fittings, etc., for direct-steam and hot-water heating systems for steam railroad service. For interurban, elevated and surface electric cars various types of electric heaters are shown, in all of which the heating element is made up with the McElroy spiral coil construction. Electric heaters of this type have been in constant and successful operation during the past twelve years. A full line of regulating switches is shown in connection with the electric heaters. The McElroy automatic axle lighting system, manufactured by the Consolidated Car Heating Company, is shown in operation. This system has been in successful operation during the past three years.

Although the Crocker-Wheeler Company has no elaborate exhibit of its own, it is well represented as builder of motors for driving machine tools, conveyors, etc., in the exhibits of machine tool builders in the building on the exhibition grounds. The company is also represented by a number of men who will be on hand during the Congress. Its most effective exhibit really is the multiple voltage plant at the Washington Navy Yard, which is highly efficient, and to which the company is directing the attention of the various delegates.

The exhibit of William Wharton, Jr., & Company, Inc., of Philadelphia, is located on Plot No. 8 on the exhibition grounds, and consists of switches, frogs, crossings, etc., for street railways as well as steam railroads, showing particularly the application of manganese steel to steam railroad track work, comprising manganese steel frogs, which are now in use on a great many of the largest railroads in the country, and are giving most phenomenal results in regard to wearing qualities; manganese steel crossings, some of which will be the actual crossings manufactured for use on some large railroads, and which are shown by the kind permission of the railroad companies before shipment to destination. The articles also include manganese steel guard rails, a manganese steel split switch and manganese steel rails. The company also shows the improved Wharton unbroken main line switch, Wharton guard rail clamps and some styles of spring rail frogs. In the street railway part there a 9-in. girder rail layout, to which are applied various methods of fastening manganese steel centers into the frogs, crossings, etc., various types of tongue switches; also the Wharton unbroken main line switch for street railways and samples of track work for electric railways with underground conduit. Besides the main exhibit the company has in the track of the Pennsylvania Railroad, at Ninth Street and Maryland Avenue, where the exhibition track branches out of the Pennsylvania Railroad main track, an unbroken main line switch and a manganese steel frog in actual service.

The Electro-Dynamic Company, of Bayonne, N. J., is in spaces Nos. 1 and 2 in Section O in the main exhibition building, and exhibits in these spaces one of its type "5-S" four to one inter-pole variable-speed motors, belted to a generator. With this motor the company is able to show the perfect operation of its inter-pole motor under varying conditions of speed from 275 r. p. m. to 1100 r. p. m., and all loads from no load to 100 per cent overload. This motor is also reversed under all of the above conditions of load and speed. The company also has on exhibition frames of different sizes of its motors running from 1 hp at a speed ratio of 4 to 1 up to 10 hp, at a speed ratio of 4 to 1; also constant-speed motors from 1 hp to 30 hp. The motors on exhibit cover 123 distinct varieties, which will enable a user of motors an opportunity for choice which has never heretofore been equaled. The Electro-Dynamic Company is rapidly enlarging its scope of operation for the inter-pole motor, and will within the next ninety days be prepared to sell at least 200 varieties of constant and variable-speed motors running up as high as 150 hp. In addition to the above exhibit one of the company's "5-S" variable-speed motors, having a speed ratio of 4 to 1, operates the electric car lighting equipment of the Consolidated Railway Electric Lighting & Equipment Company, whose exhibit is located in Spaces 9, 10, 11 and 12 in Section O. Another motor, with a capacity of 10 hp at a speed ratio of 2 to 1, will drive a vertical turret lathe in the exhibit of the Bullard Machine Tool Company. The exhibit of the Electro-Dynamic Company is indicated by the large electric sign reading "Inter-pole."

The main exhibit of the Baldwin Locomotive Works consists of one of the motor trucks built for Westinghouse, Church, Kerr & Company, and soon to be placed in service on the electrical lines of the Long Island Railroad. In design this truck resembles closely that of the equipment of the New York subway, and aside from certain features of pedestal details and end-frame arrangement conforms to the regular Baldwin type of the double-bar equalized, swing-bolster M. C. B. truck. The departures from the type to which reference is made above, were designed by George Gibbs, consulting engineer for the Long Island Railroad and first vice-president of Westinghouse, Church, Kerr & Company. Some of the details of this truck are very interesting. In weight it probably exceeds any electric truck that has been built up to this time, the total, exclusive of the motors, being 13,860 lbs. The outside pedestals and frame ends are formed of a single hammered-iron forging machined all over.

W. T. Van Dorn, of Chicago, is exhibiting the Manhattan elevated motor and trailer draw bars, also the Boston style, the Brooklyn elevated motor and trailer, and the Metropolitan West Side Elevated Railroad, of Chicago, motor and trailer draw bars and No. 11, the World's Fair type that was on the Intramural Railroad at St. Louis. He is also showing two of his large heavy type No. 19, and also models showing all the working of the different styles.

The Crane Company, of Chicago, is exhibiting locomotive safety valves, high class globe and angle valves, new renewable seat and disc globe angle and gate valves, hydraulic valves, new Crane Company's "Chicago" union check valves for high-duty service.

The exhibit of the Curtain Supply Company occupies 400 sq. ft. in section G of the main exhibition building. A raised platform will cover this space, which will be surrounded on the four sides by fluted columns, with Ionic capitals and Attic bases, all finished in ivory white. The columns will be 10 ins. in dia. by 8 ft. in height, with two similar columns of smaller design to mark the entrance. Globes of frosted glass 10 ins. in dia. and supported by lacquered brass bases, will be placed upon the tops of the columns, which will afford an effective illumination. On the two sides bordering upon the lights, heavy drapery cords will be strung between the columns, and the sides next to the adjoining exhibits will be finished with partitions of burlap, surmounted by an ornamental frieze. The interior space, which will be effectively furnished with rugs, chairs, etc., will be devoted to frames and models of the various styles of curtains and curtain fixtures which the company manufactures and which are in use at the present time.

The Merrill-Stevens Manufacturing Company, of Kalamazoo, Mich., occupies plot No. 14, with a complete line of its various types of cattle guards. These guards are regularly installed, ballast used, ties, rail and wing fences, the same as though they were lying in the roadway. The company also exhibits its "patent hog attachment" in connection with out guards. The guards referred to are the Cook's steel and "special" wood-steel guard. They are displayed in various lengths. The company also has at its exhibit a complete line of standard track or trip and car and automatic lowering jacks. It will also demonstrate its new patent, No. 787,435, which has recently been issued, and which will be one of the leading features of the company's jacks. It is now using this application on some of its jacks, creating a demand wherever used.

The Continuous Rail-Joint Company of America's exhibit shows joint splices for nine distinct purposes, as follows: (1) Regular rolled sections of joints for American Society standard rails (view 30); (2) regular rolled sections of joints for special T-rail sections; (3) regular rolled sections of joints for high T-sections of rail; (4) regular rolled sections of joints for girder sections of rail (view 31). It requires two different processes of rolling to produce a continuous joint splice for girder rails; (5) all of the above described rail joints showing the application of various designed rail bonds manufactured and in use, where the bonds are applied directly to the rail; (6) exhibit showing how, by the insertion of a copper strip in the body of the continuous rail joint, a bonding rail joint can be produced—depending upon the contact of the joint with the rail—without the addition of extra pieces or special application of the rail bond, as ordinarily in use. It is obvious that this same class of copper strip bond can be used in connection with an ordinary angle-bar or fish-plate. Furthermore, by the use of the copper strip the area of copper exposed for contact with the rail is increased twenty times. The copper strips in the bonding joint are securely soldered into place in the joint, thus making them a component part; (7) the insulating continuous rail joints exhibited comprise rolled modified sections of continuous rail joints, permitting the introduction between the joint and the rail of insulating material, also for the covering of the bolts used in this joint with insulating material sufficient to prevent contact. A modification of the quantity of insulation can be obtained by machining in the regular continuous rail-joint recesses for admitting insulating material arranged to envelop the end of one rail, leaving the adjoining rail for direct support of the rail joint, without any insulating material. By this means the quantity of insulating material is reduced one-third, thus enabling one rail to have full joint support and the enveloped rail the support outside of the insulating material. A further modification of this plan is to have the insulating material take a zigzag course on the right of one rail and left of the adjoining rail. Then it will be obvious that the opposite sides of the rail in question will have direct support of the rail joint. Butt plates between the rail ends are necessary on all of the above described insulating rail joints, as well as plates made of fiber; (8) an insulating rail joint composed of two wooden blocks, with base and butt plate, and two specially rolled steel angles, so designed that by tightening the bolts the angles will be drawn upward and give a base support to the rail joint. Quite frequently, on the question of rail joints, the idea has been to provide for the insulating properties, and the supporting efficiency of the joint to hold the rails up has been overlooked. Hence the rails have become loose, destroying the insulating qualities of the joint as well as the rails themselves. The method employed by the use of wooden blocks has not afforded sufficient strength to hold the rails in place; (9) step or compromise joints; these are manufactured of cast steel, designed to connect different sections of the rail, so that the rails are brought to the gage line of the track, the joint possessing all the requisite features of the regular rolled continuous design.

The Municipal Engineering & Contracting Company, of Chicago, Ill., has for exhibition a No. 5 Chicago improved cube concrete mixer, mounted on trucks. This machine has a capacity of from 50 to 80 cu. yds. per day, and is portable. It is intended for sidewalk work and for setting line posts, for making concrete ties, concrete foundations for buildings, station platforms, and in all places where a portable outfit is wanted. These machines are made in seven sizes, ranging from 20 to 800 cu. yds. per day—either portable or stationary.

The Franklin Railway Supply Company, of Franklin, Pa., has no exhibit, but the car heating department is represented at the convention by S. G. Allen and K. D. Hequembourg, with headquarters at the New Willard Hotel.

Among the companies represented at the congress, the Russell, Burdsall & Ward Bolt & Nut Company, of Port Chester, N. Y., is among the largest manufacturers in the world of all kinds of bolts and nuts. It makes a specialty of the manufacture of the higher grades of nuts for railroad work, and has finally succeeded in producing what has been sought for many years, viz., steel nuts, which are stronger, tougher and better in every way than nuts made of iron. These nuts are furnished cold punched, also semi-finished and finished and case hardened. For general locomotive work, the semi-finished nut is usually furnished, while the finished case hardened nuts are employed on crank-pins, knuckle-pins, etc.

The F. E. Reed Company, of Worcester, Mass., has on exhibit in Washington an 18-in. high-speed engine lathe and a 16-in. motor-driven engine lathe.

The Niles-Bement-Pond Company, of New York, is exhibiting at the American Railway Appliance Exhibition the following list of fine tools, in Section S of the main exhibition building, the entire section being required to contain them: 42-in. Pond planing machine, motor driven; 42-in. Pond standard lathe, motor driven; 37-in. Niles boring mill, motor driven; 400-ton Niles hydraulic wheel press; 1100-lb. single frame steam hammer and an 18-in. slotting machine. The Pratt & Whitney tools include a 2 in. x 26 in. new model turret lathe, with locomotive outfit; 14-in. engine lathe; 6 in. x 14 in. thread milling machine; 24-in. standard measuring machine, and a large variety of standard gages for couplers, knuckles, flange thickness, locomotive and car wheel, etc. The company also shows the large case which was exhibited at St. Louis with a full line of Pratt & Whitney small tools, including taps, dies, reamers, ratchet drills, milling cutters, lathe tools and other tools presented in its small tool catalogue. In addition to the above the company has installed in the Westinghouse exhibit the following tools, which are to be operated by electricity: Niles new extra heavy 90 in. driving-wheel lathe, and Niles No. 3 double axle lathe. It is somewhat unusual to place as heavy a machine as the driving-wheel lathe in an exhibit of this sort, as there were no facilities for erecting the same other than the temporary structures, and the company had no little difficulty in assembling the machine. This, however, is a very important machine in the railway field, and is the newest design and highest power machine on the market.

The O. M. Edwards Company, of Syracuse, N. Y., exhibit consists of eight or ten designs of windows and four or five designs of extension platform trap doors, all suitable for steam and electric railway coaches. The company is distributing two sheets illustrative and descriptive of two of its most successful designs of window fixtures, and one sheet illustrative and descriptive of one of its most successful designs of extension platform trap door fixtures. The window designs are known as No. 1-B1 drawing No. 112, and No. 7-B1 drawing No. 205, and its trap door design "G" to drawing No. 500. The company also had reprinted an article from the STREET RAILWAY JOURNAL of July 16, 1904, which illustrates and describes one of the window fixture signs referred to, namely, No. 7-B1; also one design of its extension platform trap door fixtures, design "S," as applied to electric cars built for the Schenectady Railway Company.

Williams, Brown & Earle, of Philadelphia, have an interesting exhibit of the very latest and best type of continuous electrical blue printing machine, and also the latest type of blue print washing and drying machine. These can be operated separately or geared together so as to wash and dry a continuous blue print of any length.

The Southern Exchange Company, of New York, has its exhibit in plot No. 3, in the center aisle of the grounds, next to the Westinghouse Electric & Manufacturing Company. It consists of long leaf yellow pine octagonal and square poles, Southern white cedar poles and Georgia long leaf yellow pine cross-arms, insulator pins and glass insulators. The company represents also E. P. Morris & Company, of New York, in iron brackets and pole hardware. Walter E. Mitchell, manager sales department; E. G. Chamberlin, New York manager, as well as A. J. McKinnon, vice-president and treasurer, are in attendance.

The Elliot Frog & Switch Company, of East St. Louis, Ill., has an exhibit of the latest improved designs of frogs, switches and switch stands. Its Eureka spring frog embodies the latest improvement in this type of frog for main line use. The company's sliding frog is a yard frog for heavy service. The company also has several designs of split switches, with adjustable rods and reinforced points. In the line of switch stands are shown several types of high semaphore main line stand, stand with target of the semaphore pattern, and automatic yard stand.

The Beaver Dam Malleable Iron Company, of Wisconsin, shows its tie-plates and rail braces.

The Buda Foundry & Manufacturing Company, of Chicago, which has its exhibit in Section K, shows a full line of its specialties for the construction and maintenance of way. This company makes a very extended list of supplies of this nature, and naturally its exhibit is interesting from a standpoint of variety as well as from the individual features of the separate devices themselves. An excellent specimen of the Buda ball-bearing handcar attracts more than usual attention. The journals carrying ball bearings were the rocker shaft bearings, crank-shaft bearings, center bearings and journal bearings—a ball-bearing car throughout, with the exception of the connecting rod bearings. The wheels were insulated to illustrate the manner in which this work is done when the car is to be used on block signal roads having track circuit. A number of Buda pressed steel wheels are also exhibited, together with sectional views, showing the manner of construction and method of insulation. A variety of track drills is a prominent part of the exhibit. The Buda Company makes the Paulus, Buda and Harvey track styles for different weights of rail, also the Wilson drill, which is so largely in demand by electric roads for drilling holes for bond wires. All of these drills are arranged so that the top may be thrown to clear passing trains without removing the drill from the work, and they will each drill a hole in one-fifth the time required by the old ratchet style, besides having many other features to recommend them. Several designs in the way of switch stands form a noteworthy part of the exhibit. The semaphore blade with revolving lamp, also semaphore blade with stationary lamp and spectacles, both in connection with the Ramapo automatic safety base—this latter shown with improvements—is the subject of favorable comment. The semaphore stands of this company are coming into more demand every year, not only by railroads, but by interurban lines, owing to the more positive indication of the switch point which this form of signal indicates over the color and shape target. Several styles and sizes of rail benders give a good idea of the range which this company manufactures. Other things to be seen in the Buda exhibit are: Track gages, levels, car replacers of a new and improved type, ratchet and friction jacks for track and general work, ball-bearing car, engine and journal jacks, all-iron track signs of standard and new designs, brake-shoes of several types, anti-friction metals and bronzes of numerous grades for various purposes. The Paige Iron Works Department of the Buda Foundry & Manufacturing Company adds to the exhibit. This department is well known in the street railway field for its frogs, switches and crossings, a number of which are shown, all of standard size and a good example of the high-grade work which it furnishes in this line. A set of crossing gates, arranged to show interior mechanism, completes this exhibit.

The Weber Railway Joint Manufacturing Company is housed in a handsome white building of Colonial type, 30 ft. x 40 ft., located opposite the exhibit of the Pennsylvania Steel Company. A number of full-size Weber joints applied to the rail ends, as well as a number of typical cross sections, constitute the main exhibits. The company is ably represented by the following gentlemen, who have made the New Willard Hotel their headquarters: Percy Holbrook, general manager; James C. Barr, general sales agent; F. P. Thompson, New York salesman; F. A. Porr, Western representative, Chicago, and W. T.. Smettem, engineer, Chicago.

A feature of the International Railway Congress is the handsome private coach "Alabama," designed and built by the St. Louis Car Company for President H. E. Huntington, of the Pacific Electric Railway Company, Los Angeles, Cal. This car embodies some decided innovations which bid fair to mark a new era in passenger car construction for high-speed service. The framing is all steel and the construction has created a great deal of interest in railway circles. All of the work has been done at the shops of the St. Louis Car Company by the regular force of employees. The length over the bumpers of this car is 63 ft. 1 in., its total width 9 ft. 6 ins., and its height from the underside of the bottom framing to the top of the roof 9 ft. 11 ins. The coach is mounted on the St. Louis Car Company's No. 32 Hedley motor trucks and will be equipped nishes in this line. A set of crossing gates, arranged to show the interior mechanism, completes this exhibit.

The Home Rubber Company, of Trenton, N. J., has a case on exhibition at this Congress, displaying part of its general line of manufacture, and a special exhibit of its N. B. O. and O. I. M. line of goods, the N. B. O. being a high-grade sheet packing known throughout the country as Home Rubber Company's N. B. O., or Never Burn Out or Blow Out, and the O. I. M. is a rod packing for high or low steam pressure.

The Dressel Railway Lamp Works, of New York, show only a few patterns of signal lamps and locomotive headlights, but they also manufacture all styles of electric railway headlights. Their markers and tail lamps can also be used in connection with street railways.

The Acme White Lead & Color Works, of Detroit, Mich., occupies a space 10 ft. x 15 ft., which is enclosed with nine frames, 4 ft. high and 5 ft. long. Each frame is filled with panels finished with the different lines of railway goods which they manufacture, each panel being properly labeled for identification. Perhaps the most interesting feature of the exhibit is the frame in which is demonstrated their new product, Pandect. This is a perfect rust preventive for steel cars and structural iron, and has been used with perfect results upon a majority of the steel car equipments in the United States. It is entirely different from anything put upon the market heretofore, and is absolutely acid proof, alcohol proof, gas proof, and is not affected by extremes of temperature or moisture. Benson E. Brown, manager of the railway department, is in charge of the exhibit.

Hill, Clarke & Company, of Boston, New York and Chicago, are showing two machines for use in the repair shops of electric railways. These are not the machines that the company originally intended to exhibit, but the car containing its exhibit was wrecked on the way to Washington, so that it has substituted the machines specified.

The Locomotive Appliance Company, of Chicago, exhibits its Smyth derailing switch, Newton wrecking frog and Twentieth Century derailer, all of which are in use on quite a number of electric railways throughout the country. The exhibit is in Space P 11, main exhibit building.

R. D. Wood & Company, of Philadelphia, are distributing at the congress a very handsome brochure, showing some of their hydraulic tools and machinery.

The Ashton Valve Company, of Boston, Mass., has on exhibition the following railroad appliances: Muffler and open pop safety valves having special outside regulation for the pop; blow-off valves, improved double-spring steam gages, duplex air brake gages, both regular and high-speed style; air brake inspectors' test gages, recording pressure gages, gage test pumps and weight gage testors and heavy chime whistles.

The Philip Carey Manufacturing Company, of Cincinnati, Ohio., has an extensive exhibit at the International Railway Congress located on Plot 13, immediately in front of the main entrance of the exhibition building. The display consists of 85 per cent carbonate of magnesia pipe and boiler covering in its various forms, standard asbestos pipe and boiler covering, train pipe covering and other special insulation for various purposes, together with a full line of asbestos materials including cloth, board, paper, rope, twine, thread, etc. The exhibit also includes a model house 8-ft. square, showing the application of Carey's flexible cement roofing. It is also having prepared a model car to properly display the car roofing. The company's representatives are S. J. Bowling, of Detroit, the manager of the Baltimore office; N. S. Kenney, and the company's gentraffic manager, J. A. Weigel. After the International Railway Convention, the company will probably move the entire outfit to Manhattan Beach, N. Y., for the Master Mechanics' and Master Car Builders' Convention.

The John Davis Company, of Chicago, Ill., has on exhibition a number of its well-known Eclipse steam specialties, including steam traps, back-pressure valves, blow-off valves, reducing valves, low-pressure and vacuum-pressure regulating valves, automatic, water and air regulator, automatic stop and check valves, low-water indicator, the "Climax" joint, etc.

The American Car & Foundry Company has placed several complete cars on the exhibition track. They include the following: Steel passenger car for the Long Island Railroad; box car with pressed steel underframe; box car with structural steel underframe; 50-ton all steel coal car; 50-ton gondola car, and an 8000 gallon all steel tank car for oil.

The Johns-Manville Company, of New York, is distributing at the congress a new publication on asbestos and magnesia railroad supplies. This booklet is divided into sections describing respectively material for the motive power department, the train service department, shops, buildings, round houses and maintenance of way, refrigeration. The company also announces that it has recently completed a large plant for the manufacture of carbonate of magnesia, and is prepared to furnish a complete line of steam pipe and boiler coverings, etc., composed of carbonate of magnesia combined with asbestos fiber.

The exhibit of Harold P. Brown is located in Plot 4, near the main entrance of the grounds. Various types of electric rail bonds are shown, especially those suitable for steam roads which may equip for electrical operation, as well as a new method of obtaining high temperatures for brazing or soldering heavy pieces of metal together for applying electric bonds to rails within ten seconds instead of resorting to the ordinary methods of slowly heating the rail by gasoline torches or fires. This result is obtained by firing briquettes of a new heating compound which instantly gives off a high temperature, but without injuring or decarbonizing the metal which it touches. Mr. Brown is also operating a complete electrical testing plant with a capacity of 3000 amps. for testing various types of rail bonds, fuses or electrical apparatus. This testing plant is at the disposal of any visiting engineers.

The Standard Steel Car Company, of Pittsburg, Pa., is exhibiting a mail car made entirely of steel, with the exception of the inside trim, which is made of fire-proof wood. In addition, the company is distributing a finely printed booklet on the evolution of the steer car, showing a few of the types developed by the company.

The Pitt Car Gate Company, of New York, has on exhibit the "Double-Acting 'Pitt' Gate." This gate is novel in its construction and movements, and is held in place in its three positions by an ingenious latch. When used to protect the side of the car which is toward the middle of the street, the gate is held firmly and safely in position. But when the platform is crowded and it is desirable to discharge the passengers, the latch is lifted and the gate swung to the left away from the outgoing passengers, permitting them to pass out. When the car arrives at a terminal, and the passengers crowd on to the platform, the latch is lifted and the gate swings to the right. By this it will be seen that the double-acting gate is so designed that it always swings away from the passengers, no matter whether they are crowding on or off the car. The elevated railroad gate shown is a complete departure from present methods of opening and closing. While the present gates make it necessary for passengers to move back from the space which the gate swings into, the "Pitt" gate permits them to remain in their position on the car platform, no matter how dense the crowd, and the gateman may open the gate without any disturbance or discomfort to the passengers, and allow them to step out. When the flow of the crowd is into the car, this gate permits as many as the platform will hold to get on, when the gate may be closed behind the last passenger, cutting off those who are on the station platform and closing safely and comfortably behind the last who board the car. Another type on exhibit is the "Pitt" balance door for stores, hotels, etc.

The West Disinfecting Company, of New York, has an exhibit consisting of an ornate exhibition booth which was used at the St. Louis World's Fair, and shows various disinfecting appliances and disinfectants of peculiar interest in matters of railway sanitation. Among the exhibits are the sanitary formaldehyde gas regenerators, now used by some of the street railway systems and many of the steam railroads throughout the country for fumigating their cars by means of formaldehyde gas, the strongest fumigating agent know to science. Then, there are the Taussig automatic disinfectors and Protectus disinfectors for toilet rooms. Finally, there is a line of liquid disinfectants, for general disinfecting and cleaning purposes, the principal among which is chloro-naptholeum.

The American Brake Shoe & Foundry Company shows the progress which has been made in railway brake shoes from the time the wooden shoe was replaced by metal. Examples of the various types of brake shoes are shown illustrating the evolution of the modern brake shoe. Of course, the company only illustrates the shoes which have made a commercial success. The exhibit is an educational one largely, leading up to the steel-back brake shoes of the present day, which are rapidly becoming standard on all railroads in the United States and Canada. To the company's knowledge, so far nothing has proved more suitable for the purpose than cast iron. It has been necessary, however, to reinforce the wearing parts of the cast-iron shoe by inserts or chilled sections to delay the rapid wear, but always leaving a large portion of the wearing face of cast iron which will grind against the wheel and produce the required friction. Shoes of steel or wrought iron are generally unsuitable for the brake shoe on account of the bunching up and flowing properties of the ductile metal when highly heated, causing irregular contact with the wheel tread and intense heat on the high spots. The inserts weaken the brake shoe, as do also hard areas in the chilled brake shoe, and the steel back is applied to all types of shoes for the express purpose of holding the parts of the shoe together in event of cracks occurring, so that the shoe will not be disabled before it gives a reasonable service. The company also exhibits some samples of miscellaneous steel castings made by the Tropenas process. The exhibit is practically the same as that shown at St. Louis, where the company obtained a gold medal.

The Lodge & Shipley Machine Tool Company, of Cincinnati, Ohio, is exhibiting a 24-in. x 12-ft. patent head engine lathe, direct-driven by an 8 hp, 220-volt Bullock motor, with a speed variation of 475 to 850 r. p. m. The motor is mounted on an extended cabinet leg at the head of the lathe and connected to the spindle through gearing at the back of the headstock.

The Lord Electric Company has a display of a number of loose Thomas soldered rail bonds in the exhibit space of the Universal Railway Supply Company, of Baltimore. The Lord Electric Company is also distributing a special bulletin prepared for the International Railway Congress.

The American Steam Gage & Valve Manufacturing Company, of Boston, Mass., is not exhibiting any articles in connection with electric railways, with the exception of its duplex air brake gage, which is now used to a considerable extent by the street railways of the country.

The exhibit of the Jas. G. Wilson Manufacturing Company, of New York, consists of rolling doors in steel and in wood for closing freight sheds, car houses and power houses.

The Chicago Pneumatic Tool Company is making an exhibit of its electric drills, which are adaptable to general use in connection with street railway construction and repairs. The exhibit is located in Space 4 and 5.

The Booth Water Softening Company, of New York, shows a model of its railway type of water-softening machines something over 12 ft. high. Although the front third of the machine is cut away to make the working parts visible, the company will run water through a portion of it to illustrate the operation of its chemical devices.

The American Steel Foundries, owning the Simplex Railway Appliance Company, exhibit a general line of steel castings with their specialties, consisting of bolsters, a coupler, a cast-steel car wheel, brake beams, Susemihl side bearings and car springs. The product of the American Steel Foundries is very general in its nature, the largest pieces being heavy castings for battleships, and running down to the small miscellaneous castings used in railway equipment and machine work. A cast-steel bolster which is coming prominently into notice forms a large percentage of this railway product, and to meet the preferences for built-up designs there is shown the Simplex types of body and truck bolsters. The R. E. Janney coupler, produced by this company, contains all the features recognized as being essential in a perfect automatic coupler of the M. C. B. type, and is rapidly winning its way on its absolute merit of simplicity and strength. The "Davis" cast-steel wheel, possessing a manganese steel tread, provides a cast-steel wheel with unusual tread-wearing qualities, and is a practical insurance against wheel breakage.

The Miller Anchor Company, of Norwalk, Ohio, is showing its well-known anchor for wrecking purposes.

The Aurora Automatic Machinery Company, of Aurora, Ill., exhibits a full line of its "Thor" pneumatic tools and appliances, such as drills, turbines and hammers.

In the exhibit of the New York Air Brake Company may be found an extended array of special devices in the way of brake valves, triple valves and automatic train pipe couplers for elevated and street railway electric cars. The most prominent feature of the exhibit, is the rack containing the complete apparatus, piping and connections for a locomotive and tender, and a 70-car freight train. This installation follows ordinary practice as closely as possible, the correct length of pipe for each car, with the customary bends, valves and connections being used.

The National Lock Washer Company, of Newark, N. J., shows the National lock washer, sash lock and sash balance which are being used extensively on steam and electric cars.

The Kinsman Block System Company, of New York, exhibits a working model of the Kinsman system of train control. While the model shows the system as adapted to steam railroad service, the action is the same as on electric roads, except the trip device.

The Gold Car Heating & Lighting Company is making a very extensive display of modern equipment for heating steam railway passenger cars. A complete system of hot water circulation and a complete system of direct steam heat is in full operation. About thirty different styles of electric heaters will be shown; among others, a model of the electric heater recently adopted by the underground railways of London. Locomotive reducing valves, gages, improved steam couplers, automatic traps and train line valves are also exhibited. One of the most prominent and novel features is a new and improved heating regulating system. This company believes it has succeeded in producing an accurate and ingenious arrangement that will reduce the pressure in every car, always affording the passengers a mild and mellow heat, and which delightful condition will prevail regardless of change in weather. It is a very simple, compact and durable expedient which completely solves the problem of temperature regulation. Its presence will insure a constant, agreeable and sufficient radiation in every car. No excessive or intense heat will be possible. It has been tried very extensively during the past winter, and has fulfilled every requirement. The company is represented at Washington by Edward E. Gold, president; John E. Ward, general manager; William E. Banks, treasurer; W. H. Stocks, B. H. Hawkins, A. E. Robbins and Richard Voges.

Cooper Hewitt Electric Company's exhibit is in the Westinghouse Companies' Building, and consists of the chief types of Cooper Hewitt mercury vapor lamps; a skylight outfit for making photographs, and a complete blue printing outfit equipped with Cooper Hewitt lamps. In addition, the company shows two Cooper Hewitt vapor converters for charging storage batteries from alternating current supply. One of these converters will supply direct current for four type "K" lamps. In addition to the lamps in its own exhibit, the company has sixteen type "H" lamps, and four type "K" lamps installed in the Westinghouse building for general illumination.

The Hall Signal Company, of New York, is exhibiting at Plot No. 11, a considerable variety of signals and signalling material, some of which are available for electric as well as steam roads. Its new electric motor, style "F," is much the simplest and most substantial signal of this type that it has yet developed, and the company considers it entirely fitted for electric railway use. The minature train staff instrument is also of interest to electric railway men.

LONDON LETTER

[*From Our Regular Correspondent.*]

The Dundee, Broughty Ferry & District Tramways Company, Ltd., has been registered in Edinburgh, the purpose of this company being to install an electric tramway service between Dundee, which is already equipped with municipal tramways, and the outlying town of Broughty Ferry where many of the Dundee business people have their residences. The scheme is a direct natural development of the extensive system of electric trams already operated by the Dundee Corporation, and when completed will undoubtedly be of great service and successful. The route is about 5½ miles long, and chiefly consists of double track, although there are one or two places where single track will have to be laid down. An excellent arrangement has been made with the Corporation of Dundee, so that the cars will be able to run right into the city, while the Dundee Corporation cars will also have the right to run over the company's track in numbers proportional to the length of route belonging to each party under the agreement. The overhead system will be adopted, and contracts have already been made with Messrs. J. G. White & Company, Ltd., of London, for the whole work, both for the overhead construction and the permanent way. The scheme has been promoted by Mr. George Balfour, who is well known in Dundee, and Ex-Provost Brownlee, convener of the Tramways Committee of the Dundee Town Council, will act as chairman, and Mr. Balfour will act as managing director. (The details of the equipment to be furnished through J. G. White & Company will be found on page 844 of this issue.)

Sir John Ure Primrose, Lord Provost of the city of Glasgow, has received a cablegram from the mayor of the city of Chicago, announcing that the city had declared for the municipalization of their tramways system, and asking him if he would allow Mr. J. Dalrymple, the general manager of the Glasgow Corporation Tramways, a vacation of thirty days, so that he might visit Chicago to confer with him. The necessary leave of absence has been unanimously granted to Mr. Dalrymple, who will proceed to Chicago at an early date, and is prepared to advise the municipality of Chicago on anything that they want to know about the running of municipal tramways.

As stated last month, the fight which was just commencing when I wrote my last London letter, on account of the Administrative County of London and District Electric Power bill before a special committee of the House of Lords, has developed into the most important electrical fight in London, since perhaps the fight of the advocates of high tension electricity against the advocates of direct-current electricity in the great arbitration case of the Metropolitan District Railway, some years ago. For the promotors, Mr. Merz has naturally been the most important witness, and they have made out a very good case for themselves, their chief claims being based upon the large size of the power stations which they propose to erect, and the large size of the units which they would use in these power houses. As already stated, they propose to erect three stations in the county of London, and are basing their promotion on the use of 10,000-kw steam turbine sets. Many witnesses have been called, among them the Hon. C. A. Parsons, the inventor of the Parsons turbine, Mr. C. E. L. Brown, of Brown, Boveri & Company, of Switzerland, and Mr. S. Z. de Ferranti. A large number of manufacturers in the east of London were also called so that they might state how valuable the supply of low-priced current would be to them, as well as some of the managers of the various railways. The opposition, of course, was naturally represented by the various municipal bodies already owning powers in London, and supplying current to the best of their ability, as well as by the various companies who also own rights in the London area. Many of the figures supplied by Mr. Merz were vigorously attacked, and considerable doubt was thrown upon their value. Proof was also offered that some of the companies were already supplying current for power purposes at even lower figures than Mr. Merz proposed. The hearing has now been completed, and has been adjourned without any final decision being reached. As there are other power bills to be heard it will likely be some little time before the decision is reached. It is generally believed, however, that with the vigorous opposition of the companies and municipalities, that the bill has little chance to get through, and even if it should pass the House of Lords, it is thought that it will be killed in the House of Commons, as there is too much money already invested in electrical supply in London which might be seriously impaired were this bill allowed to go through.

At the moment of writing, it is exactly a year since the opening to the public of the electric railway from Liverpool to Southport, which it will be remembered was so successfully converted from steam by Messrs. Dick, Kerr & Company. It will be also remembered that this was the first main line in the country to be converted from steam to electricity, and the results have been watched with a good deal of interest by the other railways and by electrical engineers, the enterprise of the Lancashire & Yorkshire Railway Company naturally having been favorably commented upon. The system has now been working in its entirety for many months, and it seemed only proper, in view of the fact that it has been in successful operation for a year, that a personal inspection of it would prove of interest. It is almost unnecessary to say that the service is now generally conceded by the people in the district to be absolutely perfect, and the traffic has been increased over this line by considerably over 100,000 passengers per month, a result which is really astonishing. The increased traffic and the saving of large expense at the termini of this railway company in Liverpool, has undoubtedly amply repaid the Lancashire & Yorkshire Railway Company for the whole of its expenditure already, and Mr. J. A F. Aspinall is to be heartily congratulated on the success of this magnificent installation. Trains run on this line about every ten minutes, express trains from Liverpool to Southport being freely interspersed, which do the journey at a speed of about sixty miles an hour. An arrangement has been entered into between the Lancashire & Yorkshire Railway Company and the Overhead Railway Company, of Liverpool, by which passengers may book from any station on the overhead railway to Southport. It may interest some of our readers to know that Mr. Aspinall, accompanied by several of his engineers, is sailing immediately for the United States, and will attend the International Railway Congress to be held in Washington in the month of May.

The city of Exeter is now in full possession of its municipally-owned electrically-equipped tram-car service, the system having been formally opened this month by the mayor and Corporation officials. As is usual on these occasions, a number of specially decorated cars were taken over the route, the first one being driven by the mayor himself. The route at present consists of about four and a quarter miles, though the entire mileage will be considerably more than this when completed. As will be remembered the Council of Exeter promoted a bill in Parliament to install the tramway service at an estimated cost of about £120,000, but afterwards, as there was considerable opposition, it was resolved to construct about one-half of the system at a cost of about £60,000, and a contract was duly entered into with Messers. Dick, Kerr & Company, of London, who have efficiently carried it out, and given Exeter a service as good as that of any other municipality operating tramways. The opening ceremony passed off with entire success, and later the cars were open to the public, and extremely well patronized.

Active preparations are again being entered into by the Tramways Committee of the London County Council for a considerable extension of its existing system of electric tramways in the south of London. It is proposed that the terminus of the system at Tooting should be joined up with the existing lines in York Road, Wandsworth, and it is also proposed to electrify the tramways from North Street, Wandsworth, along York Road, Battersea Park Road, Albert Embankment and Lambeth Palace Road to Westminister Bridge, and also along the Lambeth Road to St. George's Circus. Other interconnecting small branches are also intended to be electrified, approximating altogether about seventeen and one-half miles of single line, and involving an expenditure of about half a million pounds. The conduit system of electrification will be adopted similar to that already in existence.

The London County Council is also now seriously engaged in negotiating for the purchase of the North Metropolitan Tramway Company's lines, with a view to electrifying them in the immediate future, the total sum involved being about £436,000. Although the London County Council has owned these lines for several years they have been leased to the North Metropolitan Tramways Company, with whom there has been a long outstanding dispute which now appears to be approaching settlement. Up to the present it will be remembered that the London County Council has no electrified tramways in the north of London, and the experience of the tramways in the southern parts of London has amply proved how serious is the need for electric tramways also in the northern portion of the metropolitan area. The first victory for the construction of tramways along the Thames Embankment took place last month when the London County Council's Tramway bill came up for discussion, when a hostile instruction to that portion of the bill dealing with the construction of tramways along the Embankment was proposed. The House divided itself equally, 171 voting on each side, whereupon the speaker decided that his duty was to facilitate a further discussion in the House, and turned the scale of his vote against the restrictive motion.

The Glasgow Corporation tramway cars began running to Paisley on Monday last. The cars run from Barrachine and Tollcross terminus right through to Paisley Cross, the full fares being 5½d. from the former and 5d. from the latter. The route is divided into stages similar to those of the other parts of the tramway system. Cars run at pretty long intervals up till about half-past eight o'clock each morning, but throughout the day there is a six-minute service. On Saturdays there is to be a four-minute service after one o'clock, and in the summer this service may be doubled.

The Poole & District Electric Traction Company's undertaking is to be taken over by the Corporation of Bournemouth under the Act of 1903, and the umpire has awarded the company £112,000, exclusive of various agreed-on sums. The directors estimate that the purchase price will permit of a distribution of £17 per share.

The London United Tramway Company has begun the great scheme of electric tramways in Surrey. The scheme embraces about thirty miles of track, and contracts have been given out to the value of about three-quarters of a million pounds. Ewell and Esher will then be accessible to Londoners, the new system almost touching the L. C. C.'s system at Tooting.

A portion of the contracts have been let by the Tramways Committee in connection with the construction of the South Shields electric tramways. At a meeting on March 28, the committee considered twenty-one tenders which had been received for part 3 of the work, namely, (a) conduits, (b) cables, and (c) overhead electric equipment. They recommend the Council to accept that of Messrs. Dick, Kerr & Company, Ltd., London, for the sum of £12,321 11s. The committee also considered six tenders which had been received for part 4 of the work, namely, electric tramcars with Brill trucks, and recommend the acceptance of that of Messrs. Hurst, Nelson & Company, Ltd., to supply ten cars for the sum of £5307.

Some time ago the Chester Corporation decided to extend its electric tramway system at a cost of about £17,000. The matter, however, was deferred in order that the advantages of motor 'buses might be considered. At a recent meeting of the Tramways Committee reports on the subject were presented, and it was decided to recommend the Corporation to proceed with the scheme for electric cars.

The delay in issuing the report of the Royal Commission on London Traffic is creating surprise in engineering circles. A member of the commission is recently reported to have said: "Few people know the difficulties connected with the framing of a report by thirteen men on a subject so vast. Each member has his own views as to what should be done. Then it is useless to recommend legislation that will meet the requirements of a few years, and have to be reconsidered at the end of that time. Our object is to make suggestions which will provide the basis of a permanent solution. We are nevertheless making good progress. I believe it may be taken for granted that the report will be out before Whitsuntide."

The arbitrator, Mr. L. L. Macassey, has decided that the total amount to be paid by the Belfast Corporation to the company previously operating the tramways is £296,949 14s. 6d., in addition to the Corporation assuming the liability for the company's debentures, which amount to £60,000. This is equivalent to an award of £356,948 14s. 6d. The directors estimate that this will enable them, after paying off the preference shares at par, to make a distribution of about £10 15s. per ordinary share.

The Dartford Urban District Council purposes to extend the electric tramway from London to Bexley Heath by putting down a connecting line from that place to the other side of Dartford, namely, to Horn's Cross (between Stone and Greenhithe)—eight and a quarter miles single track. The Council has, however, resolved to lease the line to Messrs. J. G. White & Company for five years, and, at the Council's option, for two further periods of five years—fifteen years in all. A. C. S.

PARIS LETTER

[*From Our Regular Correspondent.*]

The "Journal Officiel" for April 11 contained a declaration of "Public Utility" of a deep level underground railway or "tube" crossing Paris from north to south, with lateral branches to be eventually constructed. The declaration above referred to is really an official authorization for the construction of this line. The originator of the scheme, M. Berlier, has been endeavoring to get the matter entertained for some three years and has at last obtained the necessary financial and engineering support. The line first to be constructed will run from Montmartre to Montparnasse, running beneath the Seine about the center of the city. A period of six years is granted for the construction, and during this time the tunnel beneath the Seine will of course be constructed. Inasmuch as the last mentioned engineering achievement cannot be done by the aid of the usual Greathead shield method of piercing, by reason of the nature of the subsoil, it has been proposed in this case to artificially freeze the immediate surrounding earth through which the tunnel will be driven. The capital of the construction company, which is to be formed within the next six months, will be 27,000,000fr. ($5,400,000).

The line, which is essentially a deep level railway, will only occasionally approach to within 12 meters of the surface. Wherever this distance is exceeded it is stipulated that elevators shall be constructed for passenger service. An admirable suggestion, and which has been confirmed in the official authorization, consists in the fact that the stations on the new line shall, wherever possible, be constructed in proximity with stations forming part of the Paris-Metropolitan Railway, several lines of which are under construction.

The fares to be charged are to be the same as those on the Paris-Metropolitan Railway, that is, 15 centimes second-class single, 20 centimes return, and 25 centimes first-class single ticket. On the amount of these fares, 1 centime per ticket is payable to the Municipality of Paris, as payment for the concession.

Although this line will to a certain extent be a competitor of the Paris-Metropolitan Railway, it is estimated that such is the movement of Parisians in the direction which this railway will take, that the existence of both means of conveyance is fully justified. At present the only means of conveyance is by two and three-horse omnibuses, the tramway systems only serving a very limited portion of the route.

After many months' negotiation, the Municipality of Paris have at last agreed to replace, at its own charge, the Diatto system belonging to the Est Parisian Tramways, and running along the Rue du Quatre Septembre, to the Opera. It will be remembered that the Est Parisian is at present running its trams along this street by means of a temporary overhead trolley line, the company having obtained authorization to erect this by reason of alleged disturbance of the Diatto system caused by the construction of Metropolitan line No. 3, which has since been placed in service. As all obstruction and possible settling of the ground has now been eliminated, the city will renew the roadway, and the next budget of the city will contain a credit of 520,000fr. for the purpose of replacing the Diatto system in the street. That this item should pass without any heated discussion is an indication of the feeling expressed here against the erection of the trolley line within the principal city streets.

Meanwhile, the Municipality is very seriously discussing the omnibus and tramway system of Paris in its entirety. Several reports have been issued relative to the affair, and it has been proposed that the city undertake the whole of the omnibus enterprise and turn the present wasteful system of long stages into a large number of short journeys, established as feeders for the Metropolitan system, which will in a few years constitute a complete local railway system within the city walls. If this view is taken, it will mean the entire suppression of the present omnibus organization and service, which consists, for the main part, of journeys 6, 8 and 10km in length, occupying 50 minutes to 80 minutes time. As regards tramways, it is suggested that the present mixed system be organized with the view of forming three complete systems, one to be controlled by the Municipality and including, for the most part, steam lines which have been in service a number of years, and the compressed air and horse tramways, some of which are the property of the General Omnibus Company. The second system, called "Northern," will include the majority of electric tramways on the north of the Seine, and now owned by several companies, exploiting the interior of Paris, and also belonging to the companies owning "lignes de penetration," or tramways coming into Paris from the environs. The third tramway system, called "Southern," will include on the southern side of the Seine companies corresponding to those working the concessions on the northern side. Monsieur Hétier is the author of the present report, which is under consideration by the Municipality, and although the question of tramway communication is the one which will receive immediate solution, the scheme will not lose sight of the omnibus services, which are deemed essential here, notwithstanding the near completion of the Metropolitan Railway and the various tramway services to be organized.

The General Omnibus Company, which has for some time been experimenting with the Gardner-Serpollet type of motor omnibuses, has finally placed a substantial order for a number of these vehicles, and the first buses will be running at the beginning of June. They will comprise the well-known Gardner-Serpollet steam generator and engine, and the fuel used is crude petroleum. No visible smoke or vapor is emitted from the omnibuses.

Quite a strong contingent of delegates has just left France to attend the coming Railway Congress in the United States. The meeting is arousing quite a deal of attention here this year, in view of the development of electric traction, and the number of engineers and others is greater than usual. The French Government, as usual, is bearing a considerable part of the total expenditure of the delegates.

A syndicate recently formed in Genoa has applied to the municipality of that town for a concession for motor omnibuses to serve the district. If the concession is obtained, it is proposed to provide some 300 omnibuses for the service.

Although in Paris and London, as well as in other large centers, the omnibus companies have been financially affected by the various electric tramways, and particularly the railways, it is an interesting fact that Berlin shows the opposite result. The General Omnibus Company, of Berlin, has recently declared a dividend of 15 per cent for 1904, against a dividend of 14 per cent for the year 1903. This good result has been obtained in face of strenuous competition on the part of overhead and underground railways and electric tramways. The Omnibus Company operates twenty-five distinct lines (twenty-two in 1903) and has an average of 443 cars in service (383 in 1903). The total number of cars or omnibuses belonging to this company is 653, and the stables contain 3244 horses. Over 400 of the omnibuses are one-horse cars, of which eighty-five were added during 1904. As indication of the success of these small cars, it is stated that 200 more of the same kind will be placed in service during the present year. Some 85,000,000 passengers were transported during 1904, against 60,000,000 in 1903. The ratio of expenses to the receipts is 74 per cent, against 84 per cent in 1902. One-cent fares are charged for a distance of about a kilometer, and the routes are laid out to serve the stations of the various Metropolitan lines.

The company ascribes its prosperous condition to the fact that it has carefully studied the new conditions arising with the advent of electric traction. The result of the year's exploitation has made a great impression in traction circles affected by this class of service in Paris.

TRAMWAYS IN COPENHAGEN DURING 1904

The reports for 1904 of the two companies operating within the metropolitan district of Copenhagen are now available, and abstracts are presented herewith. The Copenhagen Tramways Company has added 4.6 miles of electric track, and now has 51.0 miles electric and 5.2 miles horse. The Fredericksberg Company has the same trackage as last year, viz., 12.2 miles. In view of the fact that the Copenhagen tramways are obliged to purchase current from the municipality at the enormous rate of 4 cents per kw-hour, the mileage, which is at the ratio of one mile to every 7223 inhabitants, is by no means unsatisfactory.

The following are the main operating statistics:

	Copenhagen	Fredricksberg
Gross receipts	$1,435,925	$282,750
Operating expenses	950,000	195,000
Dividends	138,890	65,800
Passengers carried	55,688,872	10,836,793

The items of the working expenses per car-mile for the electric lines only will be seen from the following table. In this table two trail car-miles are counted as equal to one motor-car mile:

	Copenhagen	Frederiksberg	Suburban Line
Motor car miles	7,011,146	1,185,496	312,035
Kw-hours used	6,313,388	1,033,994	256,049
Kw-hours per car-mile	.926	.877	.651
Watt-hours per ton-mile	98.5	......	68.1
	Cents	Cents	Cents
1. Electrical energy per car-mile	3.52	3.36	1.38
2. Transportation wages, per car-mile	4.14	4.28	3.48
3. Expended on property per car-mile	.16	.28	.28
4. Maintenance of rolling stock per car-mile	1.26	1.16	1.26
5. Cleaning of rolling stock per car-mile	.36	.50	.36
6. Cleaning of track per car-mile	.36	.32	.36
7. Maintenance of track per car-mile	.74	.76	†.12
8. Maintenance of overhead construction per car-mile	.16	.20	.16
9. Miscellaneous per car-mile	......	......	......
10. Adm. and general expenses*	1.08	.84	1.20
Total expenses	11.79	11.90	8.60
Total receipts	17.98	18.82	17.05

* To this account is charged: Office rent, claims, compensations, pensions, etc., and the total amount is divided over the mileage of each motive power.

The total working expenses per car-mile, including general expenses, were for horses: Omnibuses, with two horses, 18.34 cents; tramways, with one horse, 13.56 cents.

The suburban line, mentioned in the accompanying table, owns its own power station. It was originally (from 1887-1892) operated by Rowan steam cars, but the company had to abandon the service, owing to lack of patronage. Some years after, a horse car service was established, until a new company took charge of the property in 1903, and operated the line as an electric one. The business done is mostly excursions.

During this year an attempt has been made to consolidate the two tramway companies in Copenhagen. The Frederiksberg company has agreed to this plan, but it is very doubtful whether it will be consummated, as the consolidation is dependent of a twenty years' extension of the Copenhagen concession, i. e., an extension of that period before which the municipality can take over the system. According to the present franchises this option can be exercised in 1907.

The last horse car line in Copenhagen (2 miles) will be converted to electric traction during this year, and motor omnibuses substituted for the present horse busses.

ANNUAL REPORT OF THE GENERAL ELECTRIC COMPANY

The report of the General Electric Company for the year ending Jan. 31, 1905, was made public April 25. The profits of the company for the past year, after deducting general and miscellaneous expenses and allowances for depreciation and losses, and writing off $593,624.08 from patent account, and $1,778,491.87 from factory plants and machinery, were $6,719,545.78. From this amount $759,654 were deducted as a result of revealing the assets of the Stanley Electric Manufacturing Company and other acquired interests, and $3,684,384 were paid in dividends, leaving a surplus for the year of $2,275,507. The amount of surplus at the end of the last fiscal year was $7,293,688, giving a total surplus Jan. 31, 1905, of $9,569,196.48.

The sales of the company for the past year were about $2,500,000 less than for the previous year, showing a shrinkage in business done of about 6 per cent. The total sales (amount billed to customers) during the year were $39,231,328. The total orders received were $35,094,807.

Among the important contracts, the report mentions the following: The New York Central Railroad, for thirty 90-ton electric locomotives, for 40,000-kw capacity steam turbines, for entire switchboard plants for the Mount Morris and Yonkers power stations; the Public Service Corporation of New Jersey, for steam turbines, rotary converters, etc.; the Interborough Rapid Transit Company, of New York City, for additional control equipments and motors; and car equipments for the New York City Railway Company, the Philadelphia Rapid Transit Company, the Chicago Union Traction Company, the Boston & Northern Street Railway Company, the Old Colony Street Railway Company, the United Railroads of San Francisco, etc.

Turbines—Under this heading the report states that the company has contracts for 154 steam turbines with eighty-six corporations and individuals, and that up to Feb. 1, 1905, it has sold a total of 289 Curtis turbines capable of generating in daily operation from 450,000 to 500,000-kw.

On Jan. 31, 1905, the company had equipped 2997 cars with the Sprague-General Electric control.

Referring to steam railroad work, the report says: "The electrical work of the New York Central Railroad has excited much interest among the officials of other railroads, and from the numerous inquiries and requests for plans and estimates which we receive, it is evident that we are entering upon a most interesting phase of electrical development in connection with steam railroads, and that it will not be many years before all suburban trains in the vicinity of our large cities will be operated by electric power."

The third vice-president's report shows that the three factories of the company possess 4,100,000 sq. ft. of floor space and 18,000 employees.

The first of the locomotives built for the New York Central Railroad under official tests attained a speed of 52 miles per hour with a 550-ton train and 69½ miles per hour with a 265-ton train on a 4-mile track. After the track was extended to 6 miles, unofficial tests showed a speed of 75 miles per hour. The new alternating-current railway motor has been successfully employed on two tramways, and a number of additional orders have been received. This novel form of motor is referred to as being, under certain conditions, cheaper and more economical than the standard direct-current motor, and that the field of electric traction will be extended by its use. The new "Magnetite" arc lamp is also mentioned as giving a light equal to the present carbon arc with about one-half the consumption of energy.

KANSAS SYSTEM PURCHASED

Guy Morrison Walker, of New York, has purchased for himself and F. H. Fitch, president of the Electrical Installation Company, Chicago, all the stock of the Pittsburg (Kan.) Railroad Company and of the Pittsburg Light & Power Company, from the former holders, John J. Tyler and Charles S. Hinchman, of Philadelphia. Mr. Fitch and Mr. Walker have no associates in this purchase and are the sole owners of the property. The deal is completed, and Mr.

Fitch has moved from Chicago to Pittsburg to take charge of and operate the property. The purchase was made for the purpose of extending the property, and it is expected, if local opposition does not develop, to double the mileage of the system during this year. In addition to this, Mr. Walker and Mr. Fitch expect to organize a separate company for the purpose of building a connecting link between the Pittsburg system and the Southwestern Missouri Electric Railway Company, running from Carthage, through Joplin, Mo., to Galena, Kan.

A CONSOLIDATION IN IOWA

One of the most important electric railway transactions in the history of the State of Iowa will be consummated in a few days. The deal contemplates the consolidation of two interurban and street railway systems, the construction of a fifty-one mile line connecting the two systems, and the building of a twenty-mile extension, all to be completed this year. The two companies interested are the Waterloo, Cedar Falls & Northern Railway Company, formerly the Waterloo & Cedar Falls Rapid Transit Company, with about 60 miles of street and interurban lines, and the Mason City & Clear Lake Traction Company, with eleven miles of interurban track and four miles of street lines. The plan to consolidate also includes the project to construct a connecting link fifty-one miles in length from Mason City in a southeasterly direction to Waverly, the county seat of Bremer County, and a point on the Waterloo, Cedar Falls & Northern Interurban line; the construction of an extension 20 miles in length from Summer, the present northeastern terminus of the Waterloo, Cedar Falls & Northern Company, in a northeasterly direction to West Union, Iowa, the county seat of Fayette County, and the construction of a loop through Westfield, near Waterloo, and the double-tracking of the Cedar Falls line from Broadway Junction in Waterloo to a point where the Westfield line connects with the interurban line west of Sans Souci Park.

The two companies, in anticipation of the proposed consolidation, have had a corps of surveyors in the field running the line between Mason City and Waverly, mention of which was made in the STREET RAILWAY JOURNAL recently, and as soon as the plats for the line are completed the surveyors will commence the survey of the route of the proposed extension from Summer to West Union. The construction of these two lines, 71 miles in all, will be contingent on the aid which the company will receive from the people in the country through which the lines will run. The companies will not ask for the voting of taxes in aid of the enterprise, as more stock would have to be issued in this case, and they do not desire to increase the stock issue. They do expect, however, to receive assistance in the way of donations of right of way, terminals, facilities, station grounds and promises of future business. In fact, they have already been pledged much of this kind of support.

The Waterloo, Cedar Falls & Northern Company was incorporated Dec. 11, 1895, under the name of Waterloo & Cedar Falls Rapid Transit Company. The authorized capital stock was $600,000, and the object was the construction of a street railway system in Waterloo, and of an interurban line from Waterloo to Cedar Falls. In 1896 the company had constructed 2½ miles of line in Waterloo. The line between Waterloo and Cedar Falls was completed in 1898. Between 1898 and 1902 the city lines in Waterloo were extended and improved. In 1903, the extension from Waterloo to Denver was constructed. The capital stock had been increased to $1,200,000 in Oct., 1902, with the intention of using the increased capital to construct several extensions. The company also acquired in the fall of 1903 or spring of 1904 the abandoned tracks of the Great Western between Waverly and Sumner, Iowa, and by constructing a connecting link north from Denver to a point on this line, connections were secured with Waverly, Sumner and other points. In May, 1904, the name of the company was changed to the Waterloo, Cedar Falls & Northern Railway Company. It now controls and operates about 60 miles of track. The gross earnings of the interurban lines of the company run from $100,000 to $115,000, and the net earnings from $35,000 to $50,000 a year. The company has never given out any figures on the earnings of its street railway system.

The Mason City & Clear Lake Traction Company was incorporated Dec. 19, 1896, with an authorized capital stock of $200,000. The company constructed a street railway system in Mason City and an interurban line west to Clear Lake. The cost of construction of the lines was about $300,000. The gross earnings of the company run from $40,000 to $50,000 a year, and the net earnings from $5,000 to $15,000 per year.

The consolidated companies will have, with the new lines, 146 miles of track; 126 miles of interurban tracks, and 20 miles of street railway tracks. The only people back of the project are the owners of the two interested companies.

BROOKLYN RAPID TRANSIT INCREASES TURBINE ORDER

The Brooklyn Rapid Transit Company, which is building a large extension to its Kent Avenue power plant, has changed its plans somewhat as to the initial equipment of the new building. It was at first contemplated to include in the equipment two 5000-kw turbo-generators, and with this end in view contracts were placed about a year ago with the Westinghouse Company and the Allis-Chalmers Company for these machines. Now the company has arranged with the Westinghouse Company to deliver to it two 7500-kw machines, instead of the one 5000-kw unit ordered of that company.

The Kent Avenue plant of the company was until recently the largest of the company's power stations. It serves what is known as the Eastern district and carries the load of the cars crossing the Williamsburg Bridge. The extension being built will in reality be a separate building, and is of such liberal proportions as to permit of the installation of machinery with a capacity of about 50,000-hp. The steel framework has just been completed, and now the finishing touches are being given to the structure.

TWIN CITY SHOP BUILDINGS

The Twin City Rapid Transit Company, of Minneapolis, Minn., contemplates erecting the following shop buildings during the present season: Car house, 120 ft. x 520 ft.; machine shop, 150 ft. x 200 ft.; storehouse, 100 ft. x 200 ft.; wheel, axle and gear shop, 50 ft. x 200 ft.; smith and bolt shop, 50 ft. x 200 ft.; foundry, 60 ft. x 200 ft.; track special work building, 60 ft. x 200 ft.; paint shop, 126 ft. x 300 ft.; mill, 75 ft. x 200 ft.; dry kiln, 40 ft. x 50 ft.; office building, 50 ft. x 75 ft., and a power house 50 ft. x 100 ft. All the buildings are to be of reinforced concrete construction.

THE PITTSBURG REDUCTION COMPANY'S TROLLEY PARTY

A very pleasant excursion was given to a number of electric railway and lighting men and consulting engineers of Chicago by the Pittsburg Reduction Company on April 25. Upon the invitation of E. H. Noyes, manager of this company's Chicago office, the party assembled at the Fifth Avenue terminal of the Aurora, Elgin & Chicago Railway Company in Chicago at noon, where the parlor and dining car of the Aurora, Elgin & Chicago Railway was in waiting. A fine luncheon was served on the run from Chicago to the Batavia power house of the Aurora, Elgin & Chicago Railway Company. From the Batavia power house the party was taken to Aurora, where a change was made to the fine new parlor car of the Joliet, Plainfield & Aurora Railroad, and the run was made to Joliet over that company's line. The return to Chicago was made over the Chicago & Joliet Electric Railway. A large amount of aluminum is in use for high-tension lines along the route taken by the party. Those doing the honors for the Pittsburg Reduction Company were: Alvah K. Lawrie, general sales agent; William Hoopes, electrical engineer; J. H. Finney, manager St. Louis office; E. H. Noyes, manager of Chicago office, and F. N. Baylies, salesman of Chicago. The other members of the party were R. N. Baylies, president Rockford & Interurban Electric Railway; W. A. Blanck, electrical engineer, Chicago & Milwaukee Electric Railway; E. B. Ellicott, city electrician and electrical engineer, Drainage Canal; E. C. Faber, secretary and general manager, Charles Jones, chief engineer, and Joseph O'Hara, superintendent of transportation, Aurora, Elgin & Chicago Railway; John T. Huntington, general manager, Elgin, Aurora & Southern Traction Company; F. E. Fisher, president, and F. E. Stoddard, secretary, Joliet, Plainfield & Aurora Railroad; J. R. Blackhall, general manager, Chicago & Joliet Electric Railway; J. C. McMynn, chief engineer, Robert W. Hunt Company; George W. Knox, president, Knox Construction Company; P. J. Mitten, superintendent of overhead construction, Milwaukee Electric Railway & Light Company; W. G. Carlton, engineer, Chicago Edison Company; Peter Junkersfeld, engineer, Chicago Edison Company; C. H. Wilmerding, consulting engineer; H. M. Sloan, general manager, Calumet Electric Street Railway Company; W. D. Ball, consulting engineer; J. Brett, railway department, Westinghouse Electric & Manufacturing Company; D. Royse, editor "Street Railway Review"; J. R. Cravath, Western editor STREET RAILWAY JOURNAL; F. A. Poor, Western representative Weber Rail Joint Company.

The biennial conference of Railway Young Men's Christian Associations is to be held in Detroit, Sep. 28 to Oct. 1. These conferences have attracted great attention, foreign governments, in fact, having sent skilled railroad officials and careful observers to study these large gatherings, and the movement they represent. It is too early to give a complete outline of programme.

YARDVILLE CROSSING CASE

The Yardville crossing case, which has been reviewed at length in the Street Railway Journal in the past, has again been argued before the Court of Errors and Appeals at Trenton, N. J. The Pennsylvania Railroad Company, which seeks to prevent the crossing of its single-track Camden & Amboy Railroad at Yardville, 5 miles out of Trenton, alleges that the present franchises held by the Mercer County Traction Company are invalid, in that they were passed by the Hamilton Township Committee without a public hearing, and that they were accepted, not by all the directors, but only by a majority of them. The crossing was originally sought in 1899 by the Trenton Street Railway Company for its extension from Broad Street Park just across the Trenton city line to Yardville and Crosswicks, but one technicality after another was raised, resulting in the defeat of the street railway. The line was then turned over to the Mercer County Traction Company, an allied corporation. It was then claimed that the latter company could not take the line because it covered a route already used by the Trenton Street Railway Company's line. Counsel for the street railway called attention to the former plea of the Pennsylvania Company that the extension had no legal existence because of the company's failure some years before properly to accept a franchise for a small piece of track in Broad Street Park, of which the Yardville section purported to be an extension, therefore a grant to a new company could not be a violation of the law. On this point the street railway won its case in the Court of Chancery, but the Pennsylvania took an appeal to the Court of Errors, where it has introduced the new points. There was no opposition to the franchise from the Hamilton Township people, and the measure was rushed through to protect the electric railway, which has the support and sympathy of the public in its fight. The New Jersey & Pennsylvania Traction Company and the Camden & Trenton Railway both have grade crossings of the Pennsylvania Railroad in the city of Trenton, and over far more important lines than that running through Yardville, but in each instance the electric companies forced the hand of the railroad. The New Jersey & Pennsylvania Traction tore up the Pennsylvania's track near the canal bridge on North Willow Street after notice failed to work, and blocked the rails with heaps of paving stones, flagging the line. The Pennsylvania sent an engine and coal cars into the obstruction and completely blocked the street. Mayor Katzenbach then took a hand. He ordered the railroad company to remove the coal cars immediately. After that there was no further trouble in placing the crossing. The Camden & Trenton, after the crossing at Cass Street had been guarded for weeks by the Pennsylvania Company, served notice upon that company that it would, upon a certain day, lay the crossing by force, if necessary, and it did, but the Pennsylvania backed down at the last moment. At Croydon, Pa., the Pennsylvania Railroad Company kept up its fight against the Philadelphia, Bristol & Trenton Road for seven years, but finally was beaten.

AN IMPORTANT PROJECT IN MASSACHUSETTS

Announcement has been made of a proposition on the part of the interests controlling the Fitchburg & Leominster and the Leominster, Shirley & Ayer Street Railway Companies, with some outside capital, to construct an electric railway over private right of way from the terminus of the present line at Ayer to Cambridge, there to connect with the tracks of the Boston Elevated Railway, over which the cars will be taken into Boston. The ultimate purpose is, according to the announcement just made, to build a double-track line of the most thorough construction over which cars may be operated at high speed. It is announced that the run from Fitchburg to Boston, a distance of about 42 miles, will be made in an hour and a quarter, but this is on the supposition that the transit conditions in Boston are so improved that it will be possible to run express trains over elevated tracks or through a subway from Cambridge to Boston. The proposed point of juncture is at Huron Avenue, Cambridge.

It is announced that there is available all the money necessary to build the road, which will cost in the vicinity of $2,000,000. The line from Leominster to Shirley was built with a view to an extension to Boston, and the construction is of such a character as to permit the operation of heavy cars at high speed. Plans for the road, as made by G. M. Tomson, a Boston engineer, provide for a separation of all grade crossings. There will be no grades of more than 3 per cent, and curves will all be reduced to 1 deg. or less.

Articles of incorporation will be filed at once, and the promoters will ask for franchises in the various towns and cities through which their route lies. The towns to be passed through are Ayer, Littleton, Acton, Concord, Lincoln, Lexington and Belmont and the city of Cambridge. The Boston & Maine Railroad has a line running from Fitchburg to Boston which touches at Ayer and Concord Junction, points at which it will come in contact with the proposed electric line. In places the two lines will be from 3 to 6 miles apart, so that they will draw from a somewhat different field.

THE INTERSTATE ELECTRIC RAILWAY ASSOCIATION

Representatives of ten interurban electric railway companies of the States of Illinois and Wisconsin met at Rockford, Ill., April 18, and formed an organization to be known as the Interstate Electric Railway Association. The meeting convened rather by chance than by any formal attempt to form an organization. Several companies operating near Chicago have recently adopted an interchangeable coupon ticket book similar to the one used by the Ohio Interurban Railway Association. Other companies operating in Illinois communicated with General Manager E. C. Faber, of the Aurora, Elgin & Chicago Railway Company, as to the possibility of joining in the interchangeable ticket book contract. Mr. Faber notified these companies that he would meet representatives of the roads running out of Rockford at that city on April 18, and as a result the representatives of ten companies made it a point to be in Rockford on that day. It was decided to form an association, and the name "Interstate Electric Association" was selected because the Wisconsin companies wished to join. The officers elected were: President, E. C. Faber, general manager of the Aurora, Elgin & Chicago Railway Company, Wheaton, Ill.; secretary, John T. Huntington, general manager of the Elgin, Aurora & Southern Traction Company, Aurora, Ill. Eleven companies have joined the association at present writing, as follows: Aurora, Elgin & Chicago Railway Company; Elgin, Aurora & Southern Traction Company; Joliet, Plainfield & Aurora Railroad Company; Chicago & Joliet Electric Railway Company; Chicago & Milwaukee Electric Railroad Company; Rockford & Interurban Railway Company; Rockford & Freeport Electric Railway Company; Rockford, Beloit & Janesville Railroad Company; Bloomington, Pontiac & Joliet Electric Railway Company; DeKalb-Sycamore Electric Company; Green Bay Traction Company. The president will probably call a meeting of the association soon, when a constitution and by-laws will be adopted and further details of organization perfected. The interchangeable coupon ticket book referred to, which has been adopted by the roads operating west of Chicago, contains $6 worth of 5-cent coupons and is sold for $5. The book is therefore half the size of the Ohio book, but is similar in every other respect.

NEW YORK SUBWAY AND "L" WAGE INCREASE—TRAFFIC IN THE SUBWAY FOR SIX MONTHS

E. P. Bryan, vice-president of the Interborough Rapid Transit Company, has announced an increase in the wages of guards and gatemen of the elevated roads and subway. All the first year gatemen are to receive $1.50, instead of $1.40 a day, and the second year rate of $1.70 will be given to first year guards on the rolls now, while employees promoted to be guards after May 1 will receive $1.55 a day. In making public the higher scale of wages, the vice-president has issued a statement to the effect that "prior to the strike the Interborough Company was prepared to grant increases of pay to several thousand employees, but the labor trouble prevented this plan from being carried out."

In an interview General Manager Hedley, of the Interborough Campany, said: "We are increasing the number of cars and the speed on both the elevated lines and in the subway. A year ago you could not squeeze on the platforms of the "L" cars in the rush hours half the time. Through changes we have made comparatively comfortable riding is possible. We hope to increase the speed on all our lines. We are now running "L" trains at the rate of fifteen miles an hour, where before the rate was thirteen and a half. That is for locals on all lines. The express trains are moved at the rate of twenty-five miles an hour. These figures include the stops. We now have 500 operating and can put 300 more on the tracks. The local trains are composed of five cars and the express of seven and eight. On the elevated lines the locals and the express trains are both made up of seven cars. We cannot increase the size of the trains in the subway much, as the stations are only made for eight cars. We will ultimately increase the speed of the trains. South of Ninety-Sixth Street, in the subway, both the local and express trains run on a minute headway. The "L" trains run about the same distance apart. We now run subway express trains from the City Hall to the Grand Central Station in seven and eight minutes. They go to Ninety-Sixth Street in sixteen minutes. On the elevated the express trains run to Ninety-Third Street on the Sixth Avenue line in twenty-three minutes from Park Place. On the Third Avenue line the cars go from City Hall to the Grand Central Station in seventeen minutes."

ST. PAUL RAILROAD AND NORTHWESTERN "L" AGREEMENT—ELECTRIFICATION OF THE ST. PAUL

After negotiations, protracted for several years, the Chicago, Milwaukee & St. Paul Railroad Company and the Northwestern Elevated Company, of Chicago, have entered into an "operating agreement" for a term of fifty years regarding the St. Paul's line running north from Wilson Avenue, Chicago, through Edgewater, Rogers Park and Evanston, to Llewellyn Park.

The Northwestern Elevated will operate all passenger and freight trains north of Wilson Avenue, using electricity as motive power. The work of electrifying the St. Paul line will be begun immediately by the Northwestern Company. The cost of this work is estimated at about $1,000,000. The net profits of the line north of Wilson Avenue will be divided equally between the Northwestern and St. Paul companies.

The agreement of the companies provides that the maximum fare between any two points on their lines within the city limits shall be 5 cents, and 10 cents shall be the maximum fare from any point within the city limits and any point outside of it reached by the St. Paul line. In other words, 10 cents will be the fare from any point on the "loop" to Llewellyn Park, or from Llewellyn Park to any station on the "loop."

The Chicago Council will be asked to pass an ordinance granting the St. Paul Company ten years in which to complete the elevation of its tracks from Wilson Avenue north to the city limits. It will be necessary for the companies to secure an ordinance permitting the Northwestern Elevated to operate trains over the St. Paul's line. Officials of the companies express confidence that the Council will pass such an ordinance with practically no opposition.

EMPLOYEES OF THE PITTSBURG RAILWAYS COMPANY ACCEPT COMPANY'S PROPOSAL

The employees of the Pittsburg Railways Company have accepted the terms of the company for an extension of the present working agreement between the company and the men for one year. The new agreement is in the main identical with the one that recently expired. There is, however, a concession as to the hours of service, and the request of the men that bulletin boards be placed in each of the car houses has been granted. The clause governing the hours per day to be worked places the minimum at eight and the maximum at eleven hours, with 10 per cent of leeway. The men do not get either the clause asking for more money or the establishment of a board of arbitration. In place of the board of arbitration the company has agreed that when an employee is discharged for any cause other than that of incompetence an official of the organization can appear with the discharged man before either Mr. Murphy or Mr. Callery, of the company, and secure a hearing.

PLANS FOR SOUTHERN LINE

Plans are being considered for the Carolina Traction Company's proposed line, to be 66 miles long, with terminals at Clinton, Laurens, Union and Spartanburg, all in South Carolina. At Clinton, railroad connection would be made with the Seaboard Air Line and Atlantic Coast Line; at Laurens with the Atlantic Coast Line and the Charleston & Western Carolina road; at Spartanburg with two divisions of the Southern Railway, and also with the Charleston & Western Carolina Railroad; at Glenn Springs with the Glenn Springs Railway, and at Union with the Southern Railway.

The territory to be traversed is well developed agriculturally, and contains several valuable water powers. There are four rapidly growing towns, and the total population within two miles of the line is estimated at 72,000. The road will reach two leading summer resorts of the State. An engineer has not yet been employed, and the promoters are looking to finance the project. Probably $300,000 will be supplied by persons along the road, but the remainder of $1,500,000 will be sought for elsewhere.

A map of the proposed road shows that a short line would extend from Clinton to Laurens. From a point midway on this road a much longer line would run north to Glenn Springs, intersecting there with another division extending from Union to Spartanburg.

The Battery loop of the Brooklyn extension of the New York underground road is completed. This excavation of more than two and a half acres, with a depth of from 22 to 24 ft., is now ready for the laying of the two tracks. In two weeks the Brooklyn section of the tunnel, which is now operated from the City Hall to Fulton Street, will be operated to Rector Street, and by July 1 the Degnon Company, excavating on Broadway, will have its work completed to the Battery, and that section of the Brooklyn division will soon thereafter be in operation.

LANSING & JACKSON ELECTRIC RAILWAY PROPERTIES NEARING CONSOLIDATION

A syndicate composed of Myron W. Mills, George G. Moore and James R. Elliott, of Port Huron, Mich., has just purchased through W. A. Boland, 31 Nassau Street, New York, the holdings of Spitzer & Company in the stock of the Jackson & Battle Creek Traction Company. Mr. Boland will still retain his interest in the company and also his interest in the Jackson Consolidated Traction Company. As he is connected with the Mills syndicate in the Lansing & Jackson Traction Company, which is now constructing a line between Lansing and Jackson, and as the Mills syndicate now owns the Lansing Traction Company, the recent purchase clearly indicates the coming consolidation of the various electric railway properties in and about Lansing and Jackson.

IMPORTANT RULING REGARDING CHICAGO TRANSFERS

Judge Grosscup has made permanent a temporary injunction restraining the city of Chicago from enforcing the so-called interchangeable transfer ordinance. The decision is expected to materially enhance the value of railway property, in negotiations looking toward municipal ownership. Judge Grosscup held that the ordinance is illegal as affecting contract rights, and that enforcement of the ordinance would practically result in reducing the rate of fare to 2½ cents. Notice was immediately given that the city would appeal to the United States Circuit Court of Appeals.

THE NEW OFFICES AND DRAUGHTING ROOM OF THE E. W. BLISS COMPANY

The tendency of the most progressive industrial organizations to make their employees' surroundings as cheerful as possible is well illustrated by the new offices and draughting room installed by the E. W. Bliss Company in its new brick and steel building at Adams and Plymouth Streets, Brooklyn, which has taken the place of the building that was destroyed by fire on Jan. 22, 1904. The office department is on the sixth floor, and is divided in the center by a broad aisle, which, like the rest of this floor, is covered with noiseless rubber tiling. The bookkeeping department is partitioned off on one side of this aisle, while the rest of the office force is divided among a number of well-lighted, handsomely-furnished rooms, all of which face some one of the three streets on the sides of this building. The steel girders supporting the ceiling are covered with fluted hardwood columns, which lend a very imposing effect to the general appearance of this floor. At the elevator entrance, there is a beautiful colored glass dome in the ceiling above one end of the aisle, between the director's and president's rooms. This dome greatly enhances the effect of the artificial lighting. A splendid marble lavatory is located at one end of this floor, but in addition there are separate wash basins in every room, some of which are exposed and others in closets.

The draughting room, which is on the floor above, is also a model of neatness and quiet, and, as it is located on the top floor, is exceptionally well lighted. The company has here a complete equipment for photographic work and for blue printing by electricity. On this floor there is also a vault for storing all drawings.

The five other floors of this building are used for general machine work. To insure adequate protection from fire, the company has an elaborate installation of Grinnell wet and dry valve automatic sprinkler apparatus, made by the General Fire Extinguisher Company, of Providence, R. I. Besides the city water supply, the company can draw salt water from the near-by East River, through 12-in. mains. The storage tanks, each of which has a total capacity of 25,000 gallons, are on the roof. In connection with the fire-protection system, there are also used two 18-in. x 10-in. x 12-in. Fire Underwriters' pumps, each capable of pumping 1000 gallons of water per minute, which is equivalent to four 1⅛-in. smooth-nozzle fire streams.

WESTINGHOUSE PATENT NOTICE

Following closely upon the expiration of some of the Tesla polyphase patents on May 1, the Westinghouse Electric & Manufacturing Company has issued a notice calling the attention of the public to numerous other patents relative to polyphase induction and synchronous motors, dating from Dec. 3, 1889, to May 4, 1904, which it proposes to protect from infringement in the future as in the past. Twenty-four patents in all are enumerated, among them many of the most important of the Tesla patents, and patents to Stanley, Hutin and Leblanc, Lamme, Nolan and Dusinberre, covering various features of alternating-current systems.

STREET RAILWAY PATENTS

The receipt of important news by telegraph last week when the Street Railway Journal was in press necessitated a change in the make-up of the paper at the last minute that precluded the publication of all the street railway patents for the week ending April 18. Therefore is appended the list of those grants which it was found necessary to hold in order that the news might be published promptly.

787,684. Trolley; Louis Leuenberger, Van Ness, N. Y. App. filed Jan. 28, 1905. Two parts of a frame are hinged together, the forward part carrying a roller for engagement with the wire and the rear part carrying two rollers for engagement with opposite sides of the wire, to thereby retain the wheel on the wire.

787,801. Method of Fastening Wheel Tires to the Wheel Bodies in Wheels for Railway Vehicles; Thomas Stapf, Fernitz, Austria-Hungary. App. filed Sept. 28, 1904. A method of fastening wheel tires to wheel bodies which consists in bringing a mass of metal in the angle formed by the wheel body and the wheel tire and welding the mass of metal to the wheel body and the wheel tire.

787,810. Trolley Pole Catcher; John H. Walker, Lexington, Ky. App. filed June 6, 1904. Details.

787,827. Electrically-Controlled Railway Switch; Robert V. Cheatham, Louisville, Ky. App. filed Aug. 9, 1904. An electrically-controlled railway switch, comprising means for automatically closing a main switch-tongue-throwing circuit when power is shut off from the car and for breaking said circuit when the trolley carried by the car has its travel momentarily arrested in the trolley bracket, and means for automatically closing an auxiliary switch-tongue-throwing circuit when power is supplied to the car.

787,841. Curtain Fixture for Open Cars; George E. Gilman, West Newbury, Mass. App. filed Feb. 13, 1905. Details of construction of an improved curtain and curtain fixture adapted for "open" cars, comprising simple and practical means for effectively protecting the passengers from the elements.

787,856. Switch for Suspended Electric Railways; Rudolph Pfaffenbach, Leipsic, and Hermann Muller, Leipsic-Gohlis, Germany. App. filed Oct. 29, 1904. Details.

NEW PUBLICATIONS

Railway Right of Way Surveying, by Albert I. Frye; Engineering News Publishing Company, New York; 45 pages. Price, $1.

This is a brief but extremely practical treatise on a method used by the author for railroad right of way surveying, leveling and mapping. Hints are also added as to field work and apparatus.

Electric Railways, Theoretically and Practically Treated. By S. W. Ashe and J. D. Keiley. D. Van Nostrand Company; 280 pages, illustrated. Price $2.50.

The authors state in the preface that realizing the immensity of the traction field and the great demand for information concerning rolling stock the volume has been restricted to this part of the subject. Actually it is devoted almost entirely to the electrical apparatus on the car, trucks, brakes and methods of plotting and analyzing speed-time and distance curves and other graphical repsentations of motor and train performance. Viewed in this light the book is an excellent treatise and well worthy of careful study. There is far too much rule-of-thumb method in the ordinary electric railway construction and operation, and too little of the scientific analysis of train performance of which this manual treats, and the authors are to be congratulated for having laid stress upon this fact.

Stirling—A book on Steam for Engineers; cloth; 248 pages; 8 ins. x 10½ ins.; published for limited distribution by the Stirling Company, New York.

The steam engineering field is so wide that one man can hardly be expected to possess an intimate knowledge of all of its important ramifications; consequently a book on this subject if prepared by an individual necessarily must be largely a compilation of the recorded experiences of others. It is fortunate, therefore, that an excellent work on this subject has been prepared by the engineering staff of one of the leading boiler companies, thus making available the combined experience of a large number of steam specialists. The book treats practically every phase of the subject, including the selection of boilers, boiler-feed water, properties of different kinds of steam, the flow of steam through pipes and orifices, draft, piping, boiler cleaning, masonry specifications, etc. Some idea of the scope of this work may be gained from the fact that it contains the calorific values and analyses of over 200 American coals, each variety being identified by the exact geographical and bed location. There are also extended tables and descriptions of other fuels. The illustrations are numerous and excellent; the colored plates on pages 8 and 9 which show the sectional side and front elevation of a Stirling boiler being particularly good. In general, the make-up of this book is very creditable to its authors, and without doubt it will find an honored place among the best engineering reference works.

Modern Advertising, by E. E. Calkins and Ralph Holden. D. Appleton & Company, New York; 353 pages. Price, $1.50.

Although devoted principally to daily newspaper and magazine advertising, this book contains a great deal to interest the reader and advertising patron of the technical journal. The art of advertising has developed so rapidly during the past ten years that it may now almost be considered a science, and so closely it is interwoven with the daily life of the majority of people that a greater part of their necessities, luxuries and habits are influenced by it. The book under consideration also explains how advertising has also exercised a most beneficial influence on the quality of all goods which can be advertised. It would obviously be useless to make large investments in giving publicity to an article which was so inferior that it could not hold the market secured at large expense, and general experience has shown that this conclusion is borne out in practice. The book contains many pertinent suggestions on how to advertise, and is profusely illustrated.

PERSONAL MENTION

DR. J. E. LOWES, of Dayton, president of the Dayton & Muncie Traction Company and the Dayton & Northern Traction Company, has been obliged to give up active business and go to California for the benefit of his health.

MR. D. ATWOOD, at one time general manager of a constituent company of the Twin City Rapid Transit Company, is dead. Mr. Atwood was seventy years of age, and at the time of his death was in the employ of the Twin City Company.

MR. WARREN S. HALL, general manager of the Lehigh Traction Company, of Allentown, Pa., was married to Miss Jessie Scanlon, of Paterson, N. J., on April 26. Mr. and Mrs. Hall are spending their honeymoon at Old Point Comfort.

MR. H. P. BRADFORD, formerly general manager of the Mexican Tramways Company, of the City of Mexico, and lately of the Geneva Street Railway Company, of Geneva, Switzerland, and the Underground Electric Railways Company, Ltd., of London, is making a short visit to this country.

MR. WILLIS M. STREET has resigned as superintendent of the Tri-City Railway Company, of Davenport, Ia., to become superintendent of the Lansing & Suburban Traction Company, of Lansing, Mich. He has been succeeded at Davenport by Mr. W. E. Smith, assistant superintendent. Mr. Lee Hammond has been appointed assistant superintendent.

MR. WILLIAM H. COLE, who has been connected with the Goldschmidt-Thermit Company in the capacity of chief engineer for the past nine months, has resigned his position and leaves for Europe in order to pursue professional work in connection with electric tramways. Mr. Cole has been identified with a number of prominent tramway enterprises abroad, and had charge of the installation of the electric railway system at Singapore.

MR. CHARLES F. BANCROFT, of Boston, has recently become engaged to Miss Cornelia Herriman Dow, second daughter of Mr. Abbott Low Dow, of Brooklyn, New York. Mr. Bancroft is electrical engineer of the Massachusetts Electric Companies, and the Hyde Park Electric Light Company. He is also superintendent of motive power and machinery of the Boston & Northern Street Railway Company and the Old Colony Street Railway Company, which are controlled by the Massachusetts Electric Companies. The wedding is to take place at 92 Remsen Street, Brooklyn, on June 7.

MR. R. F. KELKER, JR., formerly of the International Railway Company, of Buffalo, and lately assistant engineer of the Brooklyn Rapid Transit Company, of Brooklyn, has resigned from the latter position and has accepted that of engineer of the Goldschmidt Thermit Company, of New York. Mr. Kelker's street railway experience, as well as his previous connection with the Pennsylvania Steel Company, and as division engineer of the Baltimore & Ohio Railroad Company, has made him an authority on track construction, particularly for street railway companies, and his knowledge of this branch of railway work will prove of great value to him in his present capacity.

TABLE OF OPERATING STATISTICS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. * Including taxes. † Deficit.

Company	Period	Total Gross Earnings	Operating Expenses	Net Earnings	Deductions From Income	Net Income, Amount Available for Dividends
AKRON, O. Northern Ohio Tr. & Light Co	1 m., Mar. '05	67,113	38,166	28,948	22,917	6,031
	1 " " '04	62,110	36,617	25,493	22,467	3 026
	3 " " '05	192,890	110,720	82,171	68,751	13,421
	3 " " '04	178,601	107,869	70,731	67,601	3,132
AURORA, ILL. Elgin, Aurora & Southern Tr. Co	1 m., Feb. '05	31,390	20,825	10,566	9,133	1,432
	1 " " '04	33,132	21,999	11,132	9,133	1,999
	8 " " '05	305,387	173,889	131,498	74,306	57,192
	8 " " '04	310,087	184,339	125 748	73,507	52,240
BINGHAMTON, N. Y. Binghamton Ry. Co.	1 m., Mar. '05	18,989	10,686	8,303	------	------
	1 " " '04	17,031	10,610	6,421	------	------
	9 " " '05	191,989	102,591	89 398	62,915	26,484
	9 " " '04	177,846	96,595	81,251	57,366	23,885
BOSTON, MASS. Massachusetts Electric Co	3 m., Mar. '05	1,271,245	1,103,538	167,707	389 345	†221,638
	3 " " '04	1,156,297	1,221,627	†65,330	350,581	†415,911
	6 " " '05	2,730,212	2,140,197	590,015	767,613	†177 598
	6 " " '04	2,606,310	2,247,179	359,131	699,364	340 233
BUFFALO, N. Y. International Tr. Co.	1 m., Mar. '05	335,225	193,689	141,536	139,523	2,013
	1 " " '04	315,022	215,265	99,757	137,633	†37,876
	3 " " '05	946,233	589,748	356,485	402,828	†46,343
	3 " " '04	896,340	616,314	280,026	400,827	†120,801
	9 " " '05	3,198,962	1,739,033	1 459 929	1,236,168	223,761
	9 " " '04	3,071,106	1,781,092	1,290,014	1,197,272	92,742
CHICAGO, ILL. Aurora, Elgin & Chicago Ry. Co	1 m., Feb. '05	23,099	18,898	4,201	------	------
	1 " " '04	20,321	------	------	------	------
	8 " " '05	316,899	175,224	141,674	------	------
Chicago & Milwaukee Elec. R. R. Co.	1 m., Mar. '05	30,290	15,144	15,146	------	------
	1 " " '04	22,839	10,093	12,746	------	------
	3 " " '05	78,716	44,686	34,029	------	------
	3 " " '04	59,873	31,489	28,384	------	------
CLEVELAND, O. Cleveland, Painesville & Eastern, R. R. Co.	1 m., Mar. '05	14,134	*9,135	4,999	------	------
	1 " " '04	14,958	*9,392	5,566	------	------
	3 " " '05	38,689	*27,843	10,846	------	------
	3 " " '04	38,383	*27,323	11,059	------	------
Cleveland & Southwestern Traction Co.	1 m., Mar. '05	37,219	24 635	12,585	------	------
	1 " " '04	33,860	24,471	9,389	------	------
	3 " " '05	102,385	70,335	32,050	------	------
	3 " " '04	89,168	69,527	19,640	------	------
DETROIT, MICH. Detroit United Ry.	1 m., Mar. '05	382,722	*236 178	146,544	90,285	56,259
	1 " " '04	334,206	*224,396	109,810	90,315	19,495
	3 " " '05	1,060,095	*676,453	383,642	276,693	106,949
	3 " " '04	933,993	*656,428	277,565	267,670	9,895
DULUTH, MINN. Duluth St. Ry. Co	1 m., Mar. '05	50,864	39,218	21,646	16,747	4,899
	1 " " '04	48,036	31,381	16,655	16,505	150
	3 " " '05	141,908	82,460	59,448	50,188	9,260
	3 " " '04	135,462	87,929	47,533	49,325	†1,792
FORT WORTH, TEX. Northern Texas Traction Co	1 m., Mar. '05	53,689	30,221	23,468	10,938	12,531
	1 " " '04	44,251	25,300	18,951	9,908	9,043
	3 " " '05	134,221	81,016	53,205	30,643	22,562
	3 " " '04	117,215	73,576	43,639	28,575	15,064
HAMILTON, OHIO. Cincinnati, Dayton & Toledo Trac. Co	1 m., Feb. '05	30,090	20,794	9,296	16,445	†7,149
	1 " " 04	31,064	21,383	9,681	16,289	†6,608
	9 " " '05	384.901	221,854	163,047	152,040	11,007
	9 " " '04	390,067	217,276	172,791	145,088	27,704
HANCOCK, MICH. Houghton County St. Ry. Co	1 m., Feb. '05	12,144	12,223	†79	3,402	†3,482
	1 " " '04	11,167	12,092	†926	3,187	†4,113
	12" " '05	201,735	137,478	64,257	40,988	23,270
	12" " '04	188,613	124,725	63,888	35,342	28,547
HOUSTON, TEX. Houston Electric Co.	1 m., Feb. '05	30,919	20,204	10,715	8,496	2,218
	1 " " '04	26,468	20,277	6,191	7,751	†1,560
	7 " " '05	243,523	156,097	87,426	58,349	29,077
	7 " " '04	230,034	162,327	67,757	53,047	14,709
LONDON, ONT. London St. Ry. Co.	1 m., Feb. '05	11,669	10,892	777	1,925	1,148
	1 " " '04	9,316	9,855	†539	1,726	†2,265
	2 " " '05	25,052	21,681	3,371	4,048	†677
	2 " " '04	20,725	20,114	611	3,787	†3,176
MILWAUKEE, WIS. Milwaukee El. Ry. & Lt. Co.	1 m., Mar. '05	254,131	131,285	122,847	74,101	48,745
	1 " " '04	256,589	142,283	114,307	74,050	40,256
	3 " " '05	746,614	389,890	356,724	219,644	137,079
	3 " " '04	756,727	417,399	339,328	220,504	118,824
Milwaukee Lt., Ht. & Tr. Co	1 m., Mar. '05	39,310	19,786	19,524	19,051	473
	1 " " '04	29,265	18,307	10,957	15,441	†4,484
	3 " " '05	111,689	58,854	52,835	56,367	†3,532
	3 " " '04	87,019	53,511	33,508	44,934	†11,427
MONTREAL, QUE. Montreal St. Ry. Co.	1 m., Mar. '05	209,231	159,004	50,227	22,646	27,581
	1 " " '04	184,858	148,076	36,782	19,809	16,973
	6 " " '05	1,236,445	860,883	375,563	118,451	257,112
	6 " " '04	1,122,680	766,334	356,346	105,598	250,748
MUNCIE, IND. Muncie, Hartford & Ft. Wayne Ry. Co.	1 m., Mar. '05	13,521	*7,108	6,413	4,167	2,246
	1 " " '04	12,654	*6,797	5,857	3,000	2 857
	3 " " '05	37,523	*20,087	17,436	12,501	4,935
	3 " " '04	35,501	*20,640	14,861	11,000	3,861
OAKLAND, CAL. Oakland Traction Consolidated	1 m., Mar. '05	115,726	61,106	54,619	31,318	23,301
	1 " " '04	96,496	52,998	43,498	26,567	16,931
	3 " " '05	320,753	179,203	141,549	92,621	48,928
	3 " " '04	276,553	154,925	121,629	79,701	41,928
San Francisco, Oakland & San Jose Ry. Co	1 m., Mar. '05	41,703	16,178	25,525	13,425	12,100
	1 " " '04	30,078	14,096	15,982	7,815	8,168
	3 " " '05	88,196	41,621	46,574	22,125	24,450
	3 " " '04	123,255	48,012	75,242	39,013	36,230
OLEAN, N. Y. Olean St. Ry	1 m., Feb. '05	6,615	3,908	2,707	2,693	14
	1 " " '04	6,400	3,826	2,574	2,452	122
	8 " " '05	75,781	37,417	38,364	21,206	17,158
	8 " " '04	68,665	32,773	35,892	19,617	16,275
PEEKSKILL, N. Y. Peekskill Lighting & R. R. Co	1 m., Mar. '05	8,726	*5,507	3,219	------	------
	1 " " '04	7,794	*5,301	2,493	------	------
	9 " " '05	88,296	*51,018	37,278	------	------
	9 " " '04	84,850	*50,178	34,672	------	------
PHILADELPHIA, PA. American Rys. Co.	1 m., Mar. '05	109,970	------	------	------	------
	1 " " '04	103,090	------	------	------	------
	9 " " '05	1,091,525	------	------	------	------
	9 " " '04	1,047,607	------	------	------	------
ROCHESTER, N. Y. Rochester Ry. Co.	1 m., Mar. '05	136,266	76,126	60,140	27,270	32,870
	1 " " '04	117,640	66,744	50,896	26,240	24,656
	3 " " '05	395,669	228,159	167,510	81,033	86,477
	3 " " '04	340,845	206,418	134,427	78,585	55,842
SAN FRANCISCO, CAL. United Railroads of San Francisco	1 m., Mar. '05	580,734	------	------	------	------
	1 " " '04	534,044	------	------	------	------
	3 " " '05	1,641,072	------	------	------	------
	3 " " '04	1,543,357	------	------	------	------
SAVANNAH, GA. Savannah Electric Co.	1 m., Feb. '05	39,491	23,677	15,814	10,554	5,260
	1 " " '04	38,607	23,393	15,214	10,187	5,027
	12" " '05	546,634	317,728	228,906	126,479	102,427
	12" " '04	524,296	307,279	217,016	120,910	96,107
SEATTLE, WASH. Seattle Electric Co.	1 m., Feb. '05	179,925	121,573	58,352	24,880	33,472
	1 " " '04	171,744	120,746	50,997	23,488	27,509
	12" " '05	2,341,363	1,615 222	726,141	298,812	427,329
	12" " '04	2,129,053	1,506,157	622,896	279,935	342,961
SYRACUSE, N. Y. Syracuse R. T. Co.	1 m., Feb. '05	68,577	41,246	27,331	20,312	7,019
	1 " " '04	63,927	40,161	23,766	20,249	3,517
	8 " " '05	583,392	333,953	249,439	162,370	87,069
	8 " " '04	556,033	322,148	233,885	162,098	71,787
TERRE HAUTE, IND. Terre Haute Tr. & Lt. Co	1 m., Feb. '05	40,746	30,698	10,048	9,098	950
	1 " " '04	40,308	30,397	9,911	9,401	510
	12" " '05	574,927	369,628	205,300	113,002	92,297
	12" " '04	490,591	322,317	168,275	93,304	74,971
TOLEDO, O. Toledo Rys. & Lt. Co.	1 m., Mar. '05	146,565	*75,672	70,893	42,863	28,030
	1 " " '04	138,665	*77,858	60,807	41,971	18,836
	3 " " '05	430,915	*220,994	209,921	128,383	81,538
	3 " " '04	400,220	*223,767	176,453	124,874	51,579
YOUNGSTOWN, O. Youngstown-Sharon Ry. & Lt. Co	1 m., Feb. '05	40,995	*23,207	17,788	------	------
	1 " " '04	36,065	*22,310	13,755	------	------
	2 " " '05	82,051	*48,027	34,024	------	------
	2 " " '04	73,012	*46,156	26,855	------	------

Street Railway Journal

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Remittances for foreign subscriptions may be made through our European office.

NOTICE TO SUBSCRIBERS

REMITTANCES.—Remittances should be made by check, New York draft or money order in favor of Street Railway Journal.

CHANGE OF ADDRESS.—The old address should be given as well as the new, and notice should be received a week in advance of the desired change.

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 8000 copies are printed. Total circulation for 1905, to date, 156,850 copies—an average of 8255 copies per week.

The Railway Congress in Washington

The International Railway Congress of 1905, which is concluding its sessions as this paper goes to press, will go down in history as the first one at which electric traction took a prominent position. This was not particularly the case with the official programme. The subject of electric traction was only one of twenty topics considered by the Congress, and of the four papers presented upon it three were by foreign engineers. Nevertheless, there is no doubt that the subject of electricity was uppermost in the minds of many of the delegates, both those from this country and from abroad. In fact, several from Europe stated that a desire to study the progress made in electric traction in America was one of the principal objects of their visit to this country.

The interest taken in this mode of traction was particularly in evidence at the exhibition of railway appliances on the Government reservation. The president of the Exposition was a prominent electrical manufacturer, and the exhibits of electrical apparatus were visited and studied by the most important traction managers in the country. Many of these railroad men stated that they considered electricity the coming motive power on sections, at least, of their systems, and that they wished to investigate for themselves its advantages as a motive power. Altogether the situation reminded the few old-timers in the electrical business who were present, of the Minneapolis street railway convention in 1888, at which electricity was first seriously considered as a motive power on street railways. That convention was speedily followed by the practical abdication of the horse from street railway traction. Our readers are acquainted with our views on the future of the locomotive, and that while we are enthusiastic supporters and advocates of electricity for trunk line conditions, we do not look to so immediate or complete a change to electricity as in the street railway field. But when some of those steam railroad advocates whom we have always looked upon as being among the most conservative in the country speak so enthusiastically of electricity as in their published utterances last week, we may be pardoned for expressing satisfaction at the outlook.

Abstracts of three of the four announced papers at the Congress on electric traction are published in this issue, and the fourth will appear in that of next week. The authors of all four are operating engineers, and their views of the subject are worthy of the most careful consideration.

Interchangeable Ticket Book in Illinois

We have discussed interurban interchangeable ticket matters in Ohio and Indiana at length recently. The organization of an association in Illinois and Wisconsin and the adoption by some of the Illinois roads of a book very similar to that adopted by the Ohio roads adds another factor to the general problem of securing an interchangeable ticket which will be good on any of the interurban lines of the Middle West. We think every interurban manager realizes that it is extremely important that the same form of interchangeable transportation be adopted by the interurban roads in all the Central Western States. The more roads upon which an interchangeable ticket is good, the greater will be its sale and the greater the chances for the interurban roads getting the business of regular commercial travelers. The desired end will be partially defeated if the commercial traveler must buy a lot of different books. We are inclined to think that the action of the Northern Illinois roads has helped to clear the situation rather than to cloud it. It remains yet to be seen what the Southern Illinois and many of the Wisconsin roads will have to say about the matter. Part of the Illinois roads having already practically adopted the Ohio scheme, it is not unlikely that the others will fall in line. Ohio and Illinois would therefore have a uniform interchangeable book, with Indiana still undecided as to what it will do. The great difficulty in Indiana, as we have before pointed out, is the unwillingness of Indiana roads to accept a 16⅔ per cent reduction from the regular rates of fare, which are already very low on some roads. The Indiana stuation is in somewhat the same state of evolution as the Ohio situation was for the five months during which the Ohio ticket was being discussed. There are two possible ways out of the difficulty in Indiana. One is for the roads to get together and agree on a uniform rate per mile, which was talked of at the last Indiana convention, but which, nevertheless, is perhaps too radical a method to accept at once, and the other is for the roads having the lowest rates of fare in Indiana to raise their rates (as was done in Ohio) enough so that they can afford to accept the 16⅔ per cent reduction from the regular fare which the Ohio and Illinois books call for. Although the last alternative may not be easy, it looks as if under the circumstances it were going to be, everything considered, the least difficult solution of the problem.

Lightness in Car Construction

There is just now such a strong tendency to condemn the ideas of anyone who dares advocate anything like lightness in car construction that it takes courage indeed for anyone to suggest that the present clamor for weight in cars is in the nature of a fad from which there is likely to be a reaction. The general sentiment in favor of heavy cars can best be illustrated by the experience of a prominent superintendent of rolling stock who was inspecting some cars which were being built for his company by a large car building concern. Our friend objected to a certain part on the ground that it was too heavy. The car builders, at a loss to understand his unusual objection, showed him, by way of argument, what a nice lot of material he was getting for his money. He assured them, however, that it was not material, but strength that he was after, and that it costs good money to haul dead weight around year after year. The builders readily consented to lighten the part, but said it was the first time a customer had complained of too much material in a car. Our friend happens to be one of those who realize that proper design and workmanship can take the place of considerable weight in car construction.

There can only be two reasons for making any car of a given length heavy. One is to preserve it in case of wrecks in high-speed service, and the other is to insure long life and freedom from great cost of maintenance. The first reason evidently does not apply to city cars, and there is room for much thought as to ways to reduce weight without sacrificing strength and durability.

The Electrician and the Draughtsman on Car Bodies

If the designers of car bodies would always work hand in hand with a practical car shop electrician a car body would often result which, instead of offering every inconvenience possible to the electrical repair man, would give him facilities for doing his work in a satisfactory manner. Too often the draughtsman ignores the fact that wires are to be strung under the car and makes no provision for them. In like manner there is often no provision made for placing the miscellaneous switches of the lighting or heating circuits.

After the car is well under construction the wireman is set to work and told to place wires and switches wherever possible. The result of such an arrangement is too often seen in the loose and sagging cables under the car and the scattered positions occupied by switches and fuses over the motorman's cab and in the interior of the car.

It involves, of course, a little extra trouble to provide for the proper wiring of a car. The bottom framing is constructed with the idea of strength uppermost, and the draughtsman is loath to cut or bore the end sills or bridging for the passage of cables. The result is that the cables are often hung to the bottoms of the bridgings by such fastenings as leather straps, which are none too strong, and in such a case the car is not long on the road before some of the straps are broken and the cable is sagging. Often the cable when once down remains so until a portion of it coming in contact with the wheels or the brake rigging is worn through and trouble results. It would certainly be an economical departure in many cases to bore through the bridgings or use some other expedient to support the motor and resistance cables properly. If necessary, the width or the number of the bridgings could be doubled at those sills between which the cable is to be run, and then they would stand some weakening.

The habit of making no provision for the light, pump and other switches and fuses gives as much trouble to the electrician as other neglected points. There are several places in the vestibules of the average interurban or city car where a neat switchboard could be placed for the accommodation of all the small switches. These could then be set in some systematic order and in proper position with respect to their fuse blocks. The board could be sunk in a panel and provided with doors for better protection of the switches.

Another place where the troubles of the electrician are forgotten in the design of car bodies is in the matter of trap doors. In the car with longitudinal seats there is no difficulty whatever in providing for these, and they are often made to take up half the floor space. But in a car containing cross seats and a narrow aisle, the construction of a trap door is more difficult. The electrician uses the trap door both to obtain access to the motor and to observe the behavior of the commutator and the brushes. When necessary, he can get at the motor from the outside with considerable difficulty, but without some sort of a trap door it is impossible to observe the behavior of the brushes. A trap door large enough to view the brushes can always be placed in the car floor irrespective of the arrangement of the seats, and this concession at least, we think, should usually be made to the much-abused shop electrician. With every facility for observation, there is too much mystery connected with faulty motors without making the location of faults wholly a matter of conjecture, by depriving the trouble man of the privilege of viewing, while under load, the apparatus at fault. To be sure, there are some companies which purposely construct car floors very heavy and allow no openings in them, with the idea that such cars can be kept more comfortable in extremely cold weather, and that car washing with solid car floors is accompanied with less danger to the electrical equipment than if there were openings in the car floor. Of course, there are arguments on both sides of this question, but on the whole, accessibility of motors seems to be important enough to require trap doors in most cases.

Much more complete provision is being made for electric wires and other appliances on cars these days than a few years ago, and the practice of a few companies in this respect leaves little to be desired.

Wiring Under the Car

The new rules for car wiring adopted as part of the National Electrical code would, if followed on many of the old car equipments that are now running, produce a revolution in their underneath appearance. We do not pretend that the following description applies to the more recent work done in car wiring, but there are plenty of old equipments of which it is true. Often the under side of the floor and sills are covered with a network of loosely-cleated dirt-covered wires hanging so that they are ready to be torn off by the first thing that rubs against them. On such equipments, the motor cables, as well as light, feeder and pump wires, have the appearance of having been "thrown at" the car. The motor cables are probably encased in a loose, unpainted and far from water-proof hose, and as likely as not are run immediately above a wheel, where mud and dirt soon cover them. It is only a question of time until the constant dampness inside the cable will rot the insulation and result in short-circuits, if not in a serious fire. The picture is not overdrawn in regard to some equipments running to-day. Fortunately, most of such wiring is confined to smaller equipments, where short-circuits do not cause the concentration of so much energy at one point as would be the case on large, four-motor equipments with circuit breakers set for from 300 amps. to 400 amps. or more.

A Loan of a Conscience

As our readers probably remember, the city of Chicago, having taken the bear by the tail, has fervently besought the aid of Glasgow for information as to how to manage the brute. Glasgow, to be sure, has escaped with few claw marks from a similar adventure, but Glasgow's bear was a cub, to be kept in reverse order with one hand while the other worked a club. Chicago has no such luck, for Chicago's bear is of extra large size, with a long-whetted appetite and teeth and claws to match. James Dalrymple is a careful and experienced tramway manager, and a canny Scot to boot, whose advice will be valuable to those with strength of mind enough to take it, but we grievously fear that his aid will be the most strenuous in its conception of anything that has been handed out to an American municipality since the Declaration of Independence. It will virtually be to close in with that bear and bite off his claws. Glasgow has been the pattern from which many a municipal enterprise has been cut out, and it enjoys the well-nigh unique distinction of being a city that has made at least a measurable success of municipal tramways.

James Dalrymple, however, will both shock and be shocked when he gets down to business in Chicago. Puissant politics are not indigenous to the Scottish soil as they are to our own, and we fear that they will grate upon Mr. Dalrymple's nerves at times. And no less will his cautions break rudely in upon Chicago precedents. Glasgow, for instance, actually keeps up from the earnings of its system a sinking fund for the redemption of its bonds. Now, a sinking fund will look to Chicago socialistic eyes much like a device for robbing the poor-boxes. The Chicago form of trades union, too, armed with cobble stones and the virtuous consciousness of a sympathetic public, will come as a rude shock to his sensibilities. These are not theories to be discussed, but conditions to be met by whomsoever undertakes to straighten out the devious path for Chicago municipal ownership.

We credit the present government with a sincere desire to make municipal ownership go if it can possibly be made to go. It stands committed to that policy for better, for worse, and must do the best it can. It has done wisely in striving to profit by Glasgow's experience, but will it profit by that experience with the rigorous management thereby implied, supposing that the courts allow it to proceed and that it can find some means of raising the needful funds. Its first problem is a financial one of dangerous magnitude. If it can take up the necessary amount of income bonds from its own resources, the money may be forthcoming, but the amount of help it can get from outside is very questionable. That difficulty overcome, there still remains the colossal task of operating as a municipal department the huge complexity of a modern rapid transit system. Glasgow has succeeded within limits and upon a small scale. Can Chicago follow its example? As to the exact methods followed in the Scottish city, Mr. Dalrymple can and will give full information, but that is no sign that they can be successfully followed in Chicago. On the face of affairs, it might be possible to turn over the personnel of the existing system, along with its physical assets, and to continue the operation as if nothing had happened. Changes will have to be made, but the city has retained first-class engineering advice, and this part of the problem can be solved. But back of everything else lies the broad question as to whether Chicago can retain the Glasgow conscience and keep its tramway system free of fraud and graft. We want to see no such grade of alleged success as Chicago shows in its municipal lighting system, but results that Mr. Dalrymple can pass upon five years hence and call uncompromisngly honest from the Glasgow standpoint. He can start Chicago in the paths of virtue and rectitude, but will Chicago cling to them after his train pulls out for New York? Here is the vital question on which depends first, last and always the possible success of municipal ownership. It is all very well to borrow a conscience temporarily, but what is to fill its place when it has departed?

An amusing situation has already arisen in Chicago as the result of Mayor Dunne's municipal policy. There are likely to be several more such before the game is finished, but this is one of the first. A road projected through a sparsely settled suburban district in the southern part of the city wants a franchise. The matter was brought before the local transportation committee, and the committee pointed out that Mayor Dunne had pledged himself to grant no franchises to street railway companies during his term of office. To be sure, the franchise asked for was through a territory from which the promoters expected to realize but little for many years, and in fact it was partly for the purpose of developing suburban real estate that they asked the franchise. When the city fathers brought up Mayor Dunne's policy as an insurmountable objection in the way of granting any franchises, the promoters offered to build the road for the city and operate it. Then immediately the question was raised by members of the committee as to whether the city would be justified in building roads to assist in the development of suburban real estate. This incident brings up a number of pertinent questions, the most prominent among which is, What is the development of local transportation in Chicago going to be in such a state of affairs? The incident is typical of conditions which have existed in Chicago for a number of years past. The city has not been in a position to do anything itself, and it has resisted nearly all the efforts of electric railway companies to accomplish anything.

NEW WRECKING TOOL CARS FOR ELEVATED RAILWAY SERVICE

Elevated railways operating under the stress of heavy city and suburban traffic have to contend with the strenuous requirements of uninterrupted operation more closely than perhaps any other class of railroad service, and it is with this requirement in mind that the Brooklyn Rapid Transit has built and equipped two new wrecking tool cars, as herewith illustrated, which will be at all times in absolute readiness for emergency service. The elevated lines of this company, while not more subject to accidents than other roads operating under similar service, are called upon to handle an enormously heavy traffic, and therefore the company has appreciated the advantages to be gained from the provision of special equipment for taking care of and rapidly removing the effects of accidents such as derailments, collisions or others which occasionally come in railroad operation. With so great a density of traffic as that handled, even slight delays are productive of great losses to the company, not only in the form of monetary loss due to tying up of the system, but also to the public disfavor that is incurred, and the provision of facilities for reducing the time lost in such delays is in itself a valuable source of revenue.

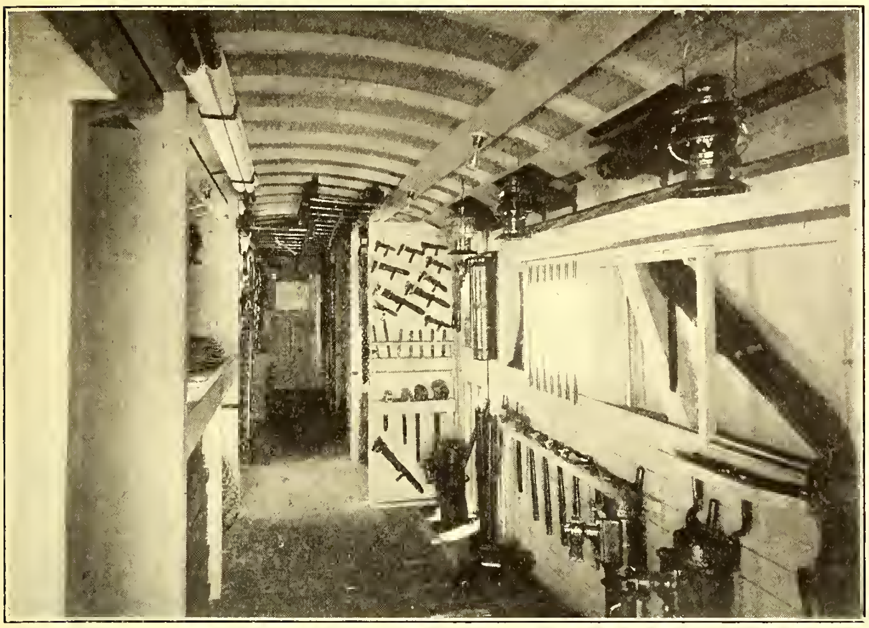
Two cars of this type have been built and equipped for the Brooklyn elevated lines, one to be stationed at the storage yard of the southern division at Fifth Avenue and Thirty-Sixth Street, and the other at the eastern division shops at East New York, corner of Fulton Street and Broadway. The details of construction of the cars are illustrated in the accompanying drawings, while the photographs present an excellent idea of the interior and exterior appearance. In details of construction, both cars are exactly similar, and the same equipment is provided in duplicate upon either car. As may be noted, their exteriors also conform very closely with the elevated railway standards of platforms, hoods, markers, jumper cables, etc., these provisions being made so that the car may be operated at any time in connection with the regular elevated trains.

The construction of the car bodies is special, to adapt them to the peculiar requirements of the service for which they are intended. As may be noted, each car has a housing 38 ft. long, the remainder of its length (13 ft.) being left open for the accommodation of a spare truck for emergency use. All features of construction are very heavy, to enable them to withstand all extremes of emergency service which they are liable to incur. The closed body portions of the cars were taken from two 38-ft. freight cars, formerly engaged in a special service upon the elevated lines, which were originally built along the general lines of freight or baggage car construction. The under framing, however, has been practically reconstructed to provide the 13-ft. open extension at one end for carrying the spare truck. Very heavy sill construction is used in the under framing, and in addition a special diagonal brace is added, as is shown in dotted lines in the open portion of the plan of the car. The general details of the body are indicated in the longitudinal and cross sections, which are also illustrated herewith; it will be noted that the arrangement of the bin partitions in the closed body portion are such as to considerably strengthen and stiffen it.

As is indicated in the drawing, and also in the interior view of the car, the closed portion is fitted out inside with ten bins, which are partitioned off, as indicated, to carry the mechanical tools, wooden blocking, rope and tackle and other appliances provided in the car's equipment. The bin construction is simple but strong, and this feature also, as above noted, is made use of to add considerably to the strength of the car body. The car is provided with wide side doors, in addition to the end doors, to facilitate the handling of tools and emergency equipment into and out of the car, and ample lighting is provided by windows in the sides as well as in the end and side doors. On account of the value of the extensive tool equipment provided in each car, the protection of the cars against theft is an important precaution; the side doors are provided with heavy gratings over the windows and with very strong inside locks, which will not be easily broken through; the side windows are also heavily barred, while the two windows in each motorman's cab, and also those in the end doors, are provided with heavy shutters, which are closed and bolted from within. The end doors, which therefore serve as the only means of entrance to the cars, are provided with heavy locks, the keys for which are carried only by the foreman of the terminal shop and his assistant, so that general access is not available to the employees of the system. This is an important feature in the operation of these cars, as otherwise they might be found a very convenient source of supply for extra tools by the workmen, and important tools would be liable to be missing when most needed on emergency runs.

This car is not equipped with motors, being intended for use entirely as a trail car; it is, however, fitted with a motorman's

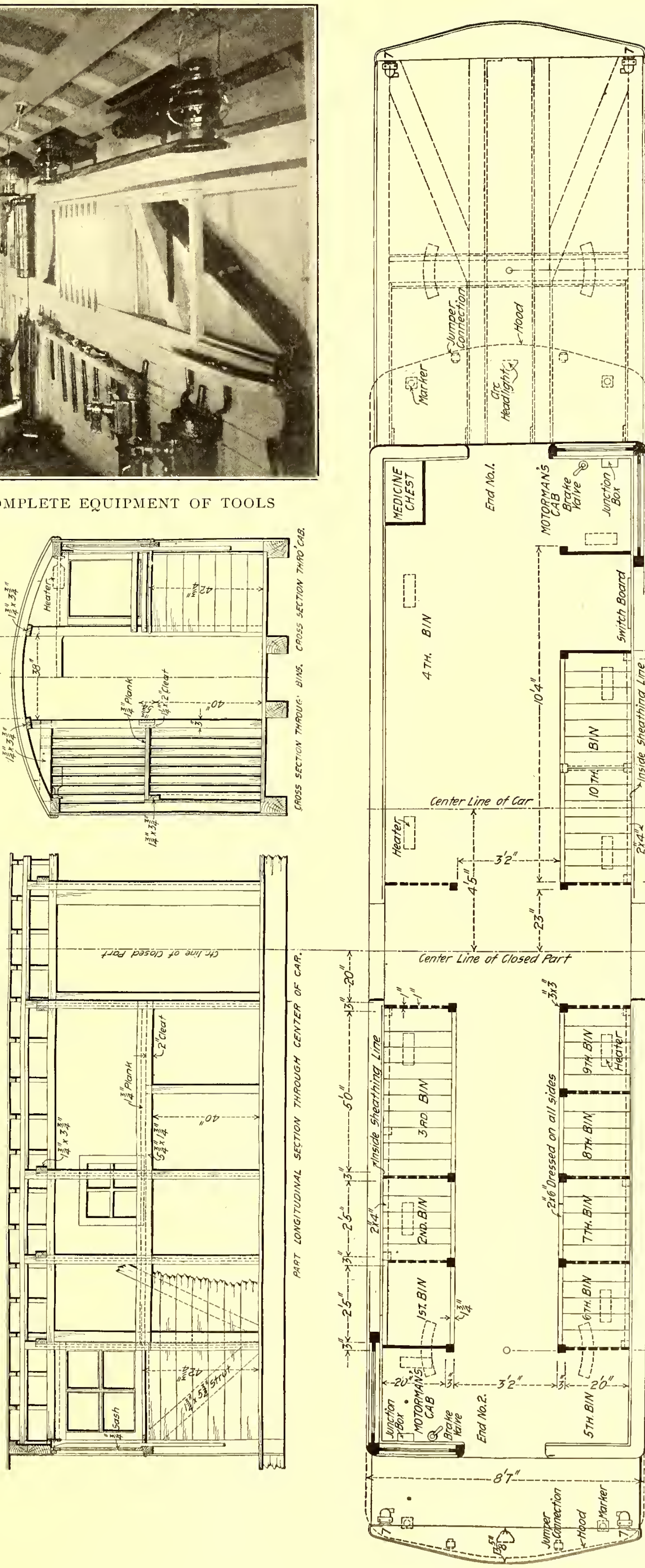
THE NEW WRECKING TOOL CAR FOR THE BROOKLYN ELEVATED SYSTEMS



INTERIOR OF CAR, SHOWING COMPLETE EQUIPMENT OF TOOLS

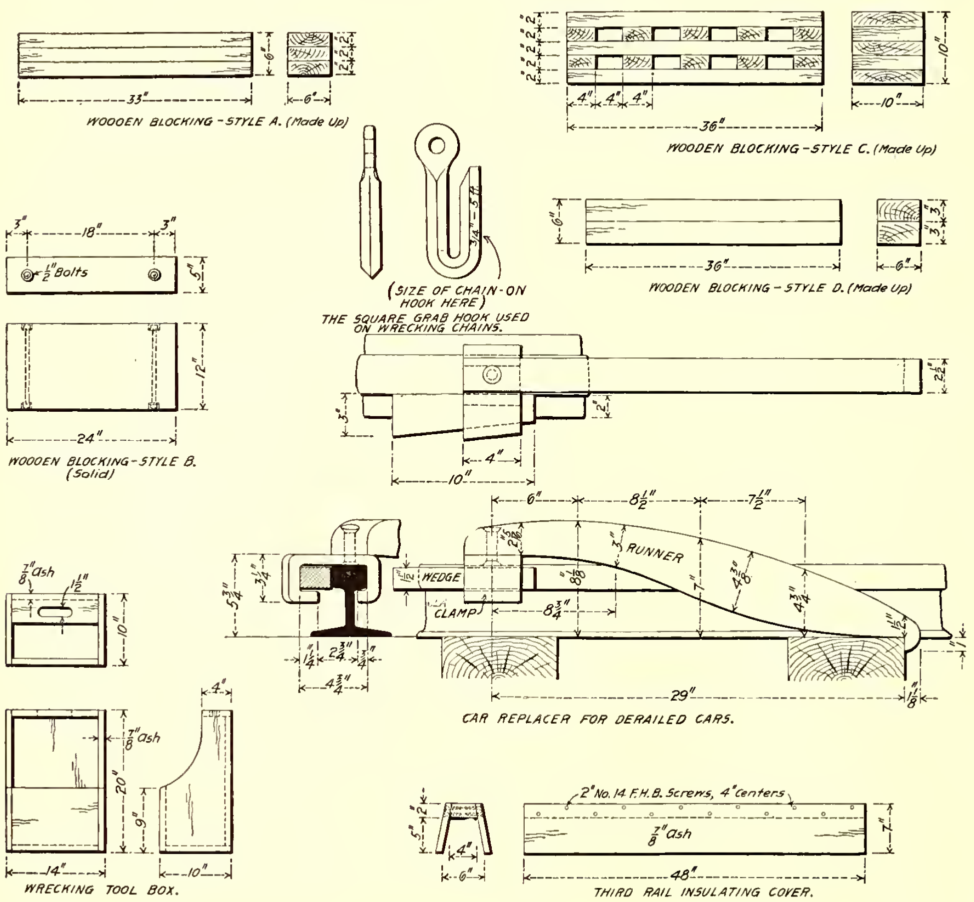
cab at either end of the closed body portion, in which is mounted a motorman's air-brake valve and the Westinghouse multiple-unit master-control switch, by which the movements of a train to which the car may be connected can be controlled. This is an important arrangement of the car, as in making emergency runs, where it is desired to have this car at the front of the train, the train control system may be connected up by means of the usual jumpers and operated from the one of these cabs which faces forward. Also, it will be noted that the car is equipped with electric lights both inside and out, an arc headlight and electric heaters, the current supply for which being taken from the adjacent cars of the train by heat and light jumpers of the usual construction; at the open end of the car, heat and light jumpers of extra length are, of course, provided to span across the space above the emergency truck to an adjacent car. Another interesting feature of the car equipment is to be noted in the application of the Eames vacuum brakes, in addition to the standard New York automatic air-brake equipment, so that the wrecking car may be operated by either a motor car or one of the former steam locomotives, if necessary, a few of the latter being still retained for switching; it will be remembered that the old steam locomotives were operated with the vacuum brakes, so that this provision makes the wrecking car universal in its application.

The handling of accidents to rolling stock upon a city elevated system requires a very different treatment from that which is possible upon surface roads, which fact consequently has had a marked influence upon the equipment of the tool car. A great



DETAILS OF THE BROOKLYN WRECKING TOOL CAR, SHOWING CONSTRUCTION OF BINS FOR BLOCKING, ROPE, TOOLS, ETC.

deal of study was given, with this in mind, not only to the design of the car, but also to the probable methods of handling it, and the result will unquestionably be productive of the best possible results in clearing the lines of blockades in emergency cases. Every facility known in the form of mechanical appliances for dismantling and handling equipment has been provided for removal as well as also for patching up, when possible, to permit of the line being cleared. The extent to which the detail of this equipment has been carried out may be best appreciated by reference to the accompanying list of tools which must be kept in each bin. A copy of this list is posted conspicuously in each car and is used as the guide in checking up the equipment, it being rigidly required that all tools called for in the list shall at all times be in their place. An interesting feature of the equipments is to be noted in the provision of stretchers and medicine chests, by which "first aid to the injured" is made possible.



SOME OF THE SPECIAL TOOLS FORMING THE EQUIPMENT OF THE CARS

LIST OF TOOLS AND MATERIAL TO BE KEPT IN ONE BROOKLYN RAPID TRANSIT COMPANY'S WRECKING CAR

First Bin—
- 1 Railroad claw bar with heel—6 ft.
- 2 Sheldon compound bars—6 ft.
- 2 Pinch bars—5 ft.
- 2 Railroad claw bars—4 ft.
- 1 Chisel bar, 1½ ins.—5 ft.
- 1 Shackle bar—5 ft.
- 1 Chisel bar—3 ft.
- 1 Lining bar—5 ft.

Second Bin—
- 1 King pin—1¾-in. diam.
- 1 Feeling king pin—1¾ ins.
- 6 White globes, No. 39 F. H. Lovell Company's signal lamp.
- 2 Green globes, No. 39 F. H. Lovell Company's signal lamp.
- 4 Red globes, No. 39 F. H. Lovell Company's signal lamp.
- 6 Dietz inspectors' lanterns.
- 2 Set of low center plates (male and female).

Third Bin—
- 3 lengths ¾-in. man rope, each 250 ft.
- 2 Double blocks with beckets, ¾-in. rope.
- 5 lengths 1-in. man rope, each 250 ft.
- 2 Heavy double blocks with beckets, 1-in. rope.

Fourth Bin—
- 2 Hand saws—30 ins.
- 5 Lip and spur auger bits, ½-in., ¾-in., 1-in., 1¼-in. and 1½-in.
- 4 Solid cast steel screw drivers, 5-in., 6-in., 8-in. and 10-in.
- 2 Octagon ball pene hammers—2½ lbs. each.
- 1 Ratchet bit brace—12-in. sweep.
- 1 Half-head railroad adze, with handle.
- 4 Socket paring chisels—1-in., 1¼-in., 1½-in. and 2-in.
- 2 Star hack saw frames—12-in.
- 2 Dozen 12-in. hack saw blades.
- 2 Broad hatchets—4 lbs.—with handles.
- 4 Stillson wrenches—12-in., 18-in., 24-in. and 36-in.
- 10 Screw wrenches, engineers' black—two 6-in., 10-in. and 12-in.; one 8-in., 15-in., 18-in. and 21-in.
- 2 Car replacers (as per drawing).
- 4 All steel side-cutting pliers—8-in.
- 3 Gas pliers—14-in., 10-in. and 8-in.
- 1 Medicine chest, containing 1 lb. pure rolled bandages—1 bottle tincture arnica, flos, etc.
- 2 Pearson pulling jacks—10 tons capacity.
- 2 Car replacing jacks—24 ins.
- 2 Norton ball-bearing car jacks—33 ins., 15 tons, style Z.
- 4 Norton ball-bearing car jacks, 24 ins., style F.
- 6 Blacksmith's sledges—One 8-in., 10-in., 14-in. and 16-in.; two 12-in.
- 2 Railroad spike mauls (old style) Verona—8-in. and 12-in.
- 1 Rack with assorted drifts and cold chisels.
- 1 Jack handle rack.
- 1 Signal flag rack.
- 1 Wire nail railroad spike and screw and bolt rack.
- 4 Nail hammers.

Fifth Bin—
- 4 Wrecking tool boxes (as per drawing), containing two 8-in. screw wrenches, 1 drift pin, 1 ball pene hammer—2½ lbs.
- 2 Third-rail insulating covers—4 ft. (as per drawing).
- 2 Third-rail insulating socket wrenches.

Sixth Bin—
- 3 Iron lock snatch blocks—1-in. rope.
- 12 Style "A" blocks, 33 ins. (made up).
- 12 Style "B" blocks, 24 ins. (solid).

Seventh Bin—
- Small blocks, shims and wedges.
- 12 Style "C" blocks (made up).

Eighth Bin—
- 24 Style "D" blocks (made up).
- Assorted blocks.

Ninth Bin—
- 4 Rail tongues.
- 40 ft. BBB ¾-in. chain.
- 80 ft. BBB ⅝-in. chain.
- 40 ft. BBB ½-in. chain.
- 60 ft. BBB ⅜-in. chain.

Tenth Bin—
- 1 coil ⅝-in. Manila rope—100 ft.
- 1 coil ¾-in. Manila rope—75 ft.
- 2 coils 3-in. Manila rope—50 ft.
- 2 7-in. 8-ton cone-bearing journal jacks—Q.
- 2 11-in. 10-ton cone-bearing journal jacks—D.
- 2 11-in. 15-ton cone-bearing journal jacks.
- 2 27-in. 30-ton hydraulic wrecking jacks.

Miscellaneous—
- 2 Tuttle tooth cross-cut saws—5-ft., with
- 2 Pairs No. 12 extra heavy Climax handles.
- 2 Stretchers.
- 2 35-ft. extension ladders.
- 6 Fire extinguishers.
- 3 Fire axes.
- 2 Spike pullers.

Bin post No. 1 ¾-in. chain 5-ft. 1-in. square grab hook.
" " 2 ⅜ " " 10 " ⅝ " " "

Bin post No. 3	⅜-in. chain	10 ft.			Vulcan hook and 5-in. ring.
" " 4	⅜ "	" 5 "	⅝ "		square grab hook.
" " 5	⅝ "	" 10 "	1 "		" "
" " 6	⅜ "	" 5 "	⅝ "		" "
" " 7	½ "	" 5 "	¾ "		" "
" " 8	½ "	" 5 "	¾ "		" "
" " 9	⅝ "	" 5 "	1 "		" "
" " 10	⅝ "	" 5 "	1 "		" "

(Square grab hook as per drawing.)

The character of the majority of the tools enumerated in the above list will be evident from a reference to the titles. Some of the special tools were, however, designed especially for this work and built at the shops of the company; the more important of these are illustrated in the accompanying detail drawings.

Special attention should be given to the interesting type of blocking used. The provision of a large variety of sizes of blocking is an important item in the equipment of a wrecking car and as so frequently used in steam road practice, the supply runs up into considerable weight, as the blocks are usually made solid. As may be noted from the drawing, however, the blocks are here, in nearly all cases, built up of smaller sized pieces, which results not only in materially reducing the weight per block and thus facilitating handling in inconvenient places, but also in greatly cheapening the cost of the blocking, as the "made-up" blocks are in all cases built up of scrap pieces of lumber from the wood shop.

The advantages of the wrecking tool boxes, as well as also the third-rail insulating covers, will be apparent from reference to the drawings. The tool boxes are always provided with two 8-in. screw wrenches, a drift pin and a 2½-lb. pene hammer, and can thus be picked up in a hurry and carried out to work with in case of emergency, serving as an excellent repository for additional tools that are brought out from the car to work with. The third-rail cover is used to cover the live conductor rail alongside the track when workmen must work in close proximity to it; this is an absolutely necessary safeguard unless the power be shut off from third rail.

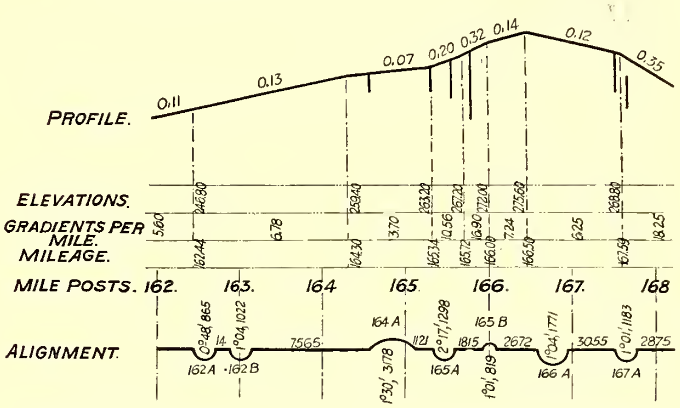
The car replacer embraces interesting features of principle and construction, in that it involves a method fastening rigidly to the running rail, so that a derailed wheel may be run upon it without fear of its tipping or jarring loose; upon an elevated structure the handling of a derailed car is of much more importance than on the surface, as there must be no mistakes on the part of the tools. This replacer furnishes the desired security in the provision for keying it very firmly to the rail by means of the wedge and clamp; its operation thence will be evident from the drawing, the runner being laid over a tie in front of the derailed wheel. The grab hooks used upon the various chains hung on bin posts Nos. 1 to 10 are of an interesting and important design; ready reference to the size of the chain is given by the label stamped on one edge of the hook, as shown in the drawing, this indicating the size and length of the chain.

An important innovation is also introduced in the equipment of the wrecking tool cars in the form of a special method of marking for each tool upon either one of the cars so that it will be evident at a glance as to which of the two cars it belongs. The importance of this provision will be realized to the fullest extent when both cars are sent to work at the same point. This is accomplished by the painting of each tool with a distinguishing body color and also a narrow color stripe around the middle portion or handle of each tool. Green is the distinguishing body color for all tools in the southern division car, while black is the body color for the tools in the eastern division car. All tools in both cars have a narrow stripe of yellow painted around the middle of the body or handle, as is convenient; this latter provision is of convenience also in distinguishing these tools from others that may be brought from the shops or other departments of the company.

As above stated, these cars were designed by the mechanical department of the company, while the details of construction were carried out entirely at the eastern division repair shops. The provision of equipment of this type not only gives the Brooklyn Rapid Transit Company the distinction of being the first electric railway system to make adequate provisions against wreck delays, but also places it in a foremost position amongst the railway companies of this country in the matter of improvement of its rolling stock equipment and mechanical facilities.

COMPARATIVE SPEED TESTS OF STEAM AND ELECTRIC LOCOMOTIVES

Under the auspices of the New York Central & Hudson River Railroad and the General Electric Company, a series of tests were made on April 29 last over the experimental track at Schenectady, N. Y., in order to secure data on the relative acceleration and speed characteristics of electric and steam locomotion. The tests were made with New York Central type electric locomotive 6000 (described in the Street Railway Journal for Nov. 19, 1904), and Pacific type passenger steam locomotive 2797, and were carried out in the presence of W. J. Wilgus, vice-president, and E. B. Katte, electrical engineer, for the New York Central, and E. W. Rice, Jr., third vice-president; W. B. Potter, engineer railway department, and A. F. Batchelder, engineering department, for the General Electric Company. The data secured were intended for private



PROFILE OF ROAD ON WHICH THE TESTS WERE MADE

information, but the results achieved were considered so remarkable that it was decided to make public the following résumé of the runs:

TIME OF TEST AND WEATHER CONDITIONS

The test started about 8 a. m. and continued until about 1 p. m. of April 29, 1905; temperature averaging about 50 degs. F.; weather, cloudy. During the time of the test no rain fell, so that the rails were perfectly dry.

DESCRIPTION OF EXPERIMENTAL TRACK

The experimental track, 6 miles in length, is the portion of old track No. 4 of the New York Central main line, formerly used for eastbound freight movements between mile-posts 162 and 168, west of Schenectady.

The track materials are 80-lb. standard N. Y. C. section steel rail, with 6-bolt 36-in. splices, sixteen yellow pine ties to the 30-ft. rail, gravel ballast, well surfaced, curves elevated for a speed of about 70 m.p.h.

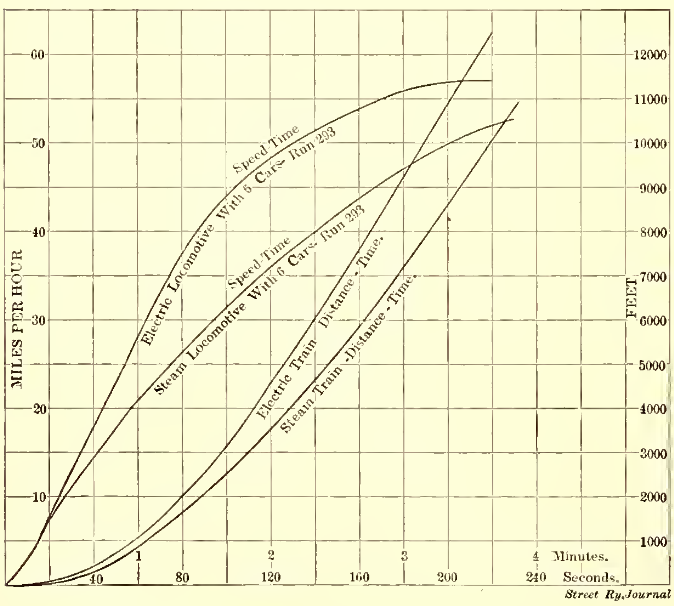
The working conductor consists of top-contact 70-lb. steel rail reinforced with copper and covered in part with a board protection. At four crossings, overhead construction is used to cover gaps where the use of the third rail is inadmissible. Experiments are about to be started with a new type of under-contact rail which, it is believed, will cure many of the evils of the ordinary top-contact third rail.

The alignment and grades are illustrated upon the accompanying condensed profile. It will be noted that from the easterly end of the track at mile-post 162, going westerly, the rising gradients vary from 5 ft. to 17 ft. per mile to a summit between mile-posts 166 and 167, and thence the track descends on gradients varying from 6 ft. to 19 ft. per mile to the end of the track at mile-post 168. It will also be noted that in the 6 miles there are seven curves, varying from 0 deg. 48 min. to 2 degs. 17 min., the maximum length of tangent being 7565 ft.

VIEW OF RUN "D," TAKEN 1500 FT. FROM THE STARTING POINT, SHOWING ELECTRIC LOCOMOTIVE ABOUT ONE TRAIN LENGTH AHEAD

SOURCE OF POWER, TRANSMISSION LINE AND SUB-STATION

The power for testing purposes is furnished by the General Electric Company, and for this purpose there has been installed at its Schenectady plant a 2000-kw, three-phase, 25-cycle Curtis turbo-generator, delivering 11,000 volts to the line. A special high-tension transmission line has been constructed for the intervening distance of about 5 miles to a sub-station that has been erected by the railroad company near mile-post 165. This sub-station contains a 1500-kw, 650-volt rotary converter, with static transformers for reducing the potential from 11,000 volts to 475 volts.



DISTANCE-TIME AND SPEED-TIME CURVES FROM RUN "D"

DIMENSIONS AND WEIGHTS OF THE TEST TRAINS

The accompanying diagram illustrates the governing dimensions and weights of both locomotives. The weights of the cars were as follows:

No.	Electric Train Car No.	Electric Train Weight Loaded, Lbs.	No.	Steam Train Car No.	Steam Train Weight, Lbs. (No Load).
8-Car Train					
1	1,060	101,900	1	2,527	79,900
2	1,070	100,400	2	1,547	86,100
3	1,082	106,200	3	1,534	87,800
4	1,092	100,100	4	1,521	84,500
5	1,097	104,650	5	1,069	86,300
6	1,550	102,800	6	1,099	87,400
7	1,552	106,000	7	1,563	86,400
8	1,558	104,750	8	1,513	86,700
Locomotive	....	200,500	Locomotive	....	342,000
Total	....	513.6 tons	Total	....	513 tons
6-Car Train					
1	1,060	101,900	1	2,527	79,900
2	1,070	100,400	2	1,547	86,100
3	1,092	100,100	3	1,534	87,800
4	1,097	104,650	4	1,521	84,500
5	1,550	102,800	5	1,069	86,300
6	1,558	104,750	6	1,099	87,400
Locomotive	....	200,500	Locomotive	....	342,000
Total	....	407.5 tons	Total	....	427 tons

AVERAGE VOLTAGE DURING ACCELERATION

Runs	Series	Series-Multiple	Multiple
A	520	540	235
B	620	520	275
C	600	540	330
D	680	680	515
E	650	600	420
F	600	620	455

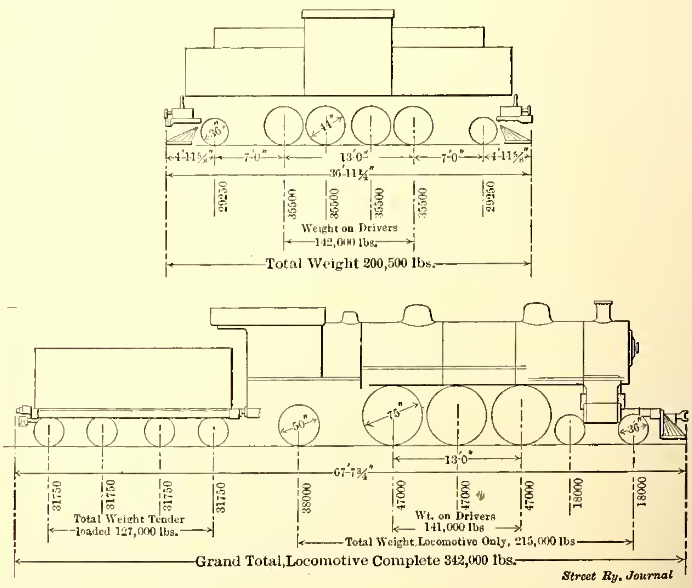


DIAGRAM OF COMPARATIVE WEIGHT DISTRIBUTION, ELECTRIC AND STEAM LOCOMOTIVES

It will be noted that, due to the restricted cross section of conductors, the voltage dropped during acceleration considerably lower than will obtain in actual practice within the electric zone in the neighborhood of New York. Therefore the results obtained in this comparative test are much less favorable for the electric locomotive than will be secured in actual practice.

SCHEDULE OF RUNS

Run "A."—The "Pacific" type steam locomotive had an eight-car train with a total weight, including the locomotive, of 513 tons, as compared with the eight-car train behind the electric locomotive weighing 513.6 tons. Both trains started together, with the steam locomotive accelerating faster than the electric locomotive, due to the abnormal drop in voltage from the pressure at the station of 700 volts, to a track voltage as low as 325 volts. At 3000 ft. from the starting point the electric locomotive gained the same speed as the steam locomotive, and from that point accelerated more rapidly, so that at a distance of 2 miles from the starting point the electric locomotive passed the steam locomotive, and at the shutting-off point was two train lengths ahead.

The maximum speed of the steam locomotive was 50 m.p.h.

The maximum speed of the electric locomotive was 57 m.p.h.

Run "B."—This run was made under the same conditions at Run "A," with results practically the same, except that the speeds were higher, as follows:

Maximum speed of steam locomotive, 53.6 m.p.h.

Maximum speed of electric locomotive, 60 m.p.h.

Run "C."—This run was made with six-car train for both locomotives, with total train weights as follows:

Electric locomotive .... 407.5 tons
Steam locomotive .... 427 tons

Owing to extreme low voltage under the conditions above stated, which during acceleration fell as low as 330 volts, at first the steam locomotive accelerated more rapidly, but at the end of about a mile the electric locomotive overtook the steam train and continued to forge ahead until the power was shut off.

Maximum speed of electric locomotive, 61.6 m.p.h.

Maximum speed of steam locomotive, 58 m.p.h.

Run "D."—In order to secure as nearly as possible results comparable with the conditions of voltage that will obtain in the actual operating zone, this run with six-car trains, similar to those used in Run "C," was started at a point nearer the sub-station, near mile-post 164. For this run the electric locomotive from the first turn of the wheels accelerated faster than the steam locomotive, as plainly evident in the photograph reproduced herewith, where, at a distance of 1500 ft. from the starting point, the electric locomotive led by a train length. The diagram shows the acceleration and speed-time curves for this run.

Run "E."—This run was made with the electric locomotive and one coach, a maximum speed of 79 m.p.h. having been attained.

Run "F."—This run was made with the electric locomotive running light and with the power shut off on curves, a maximum speed having been attained of 80.2 m.p.h. Had it not been necessary to shut off the current on curves it is believed that the locomotive would have attained a speed of over 90 m.p.h. in this comparatively short run. (A speed test on May 1 reached 85 m.p.h., with a limitation on the 2-deg. 17-min. curve of 78 m.p.h.)

RIDING QUALITIES

At all speeds the smooth riding qualities of the electric locomotive were very noticeable, especially the lack of "nosing" effects. After the runs the track was carefully examined and no tendency to spread rails was discovered. However, on the sharper curves the high speeds caused the track to shift bodily in the ballast, due to insufficient superelevation of the outer rail.

SUMMARY

The most important test is Run "D," as the voltage during that test more nearly approached the conditions that will be obtained in the electric zone. Therefore the following comparison of the steam and electric locomotives, based upon the results of Run "D," are very interesting as illustrating the marked superiority in acceleration of the electric locomotive over the steam locomotive, considering the fact that the "Pacific" type of steam locomotive has practically the same weight upon the drivers.

	Steam	Electric	Difference in Favor of Electric
Length over all	67 ft. 7¾ ins.	36 ft. 11¼ ins.	30 ft. 8½ ins
Total weight (including tender for steam locomotive)	342,000 lbs.	200,500 lbs.	141,500 lbs
Concentrated weight on each driving axle	47,000 lbs.	35,500 lbs.	11,500 lbs.
Revenue bearing load back of locomotive	256 tons	307.25 tons	51.25 tons
Acceleration M. P. H. P. S. averaging up to 50 M.P.H.	.246	.394	.148
Time required to reach speed of 50 M. P. H.	203 sec.	127 sec.	76 sec.

GEN. BANCROFT ON ROLLING STOCK IMPROVEMENTS IN BOSTON

In speaking to a representative of the STREET RAILWAY JOURNAL concerning some of the plans for improving the service on the surface and elevated lines of the Boston Elevated Railway Company, Gen. Bancroft pointed out that there are practically but three ways by which a street railway company can increase the carrying capacity over its lines. It can increase the size of its cars, it can adopt some modification of the English double-deck car, or it can run cars in trains. The first suggestion offers little in the way of relief, inasmuch as most large cities in this country have already adopted as long a car as is practicable to run through city streets. In fact, many managers are coming to the opinion that in some instances our city cars are already too long. As to the suggestion of a double-deck car there is much to be said. It is well known that in England and on the Continent the double-deck car has been accepted as a permanent standard type and seems to fill all the requirements, both from the standpoint of the public and of the company. Up to the present time, however, the public of our American cities have not espoused the idea of a second deck with any degree of enthusiasm. It is not unreasonable to assume, however, that after the advantages of this type of car are more fully understood by the American people they may regard it with more favor. Experiments in this line are now being made in this country, notably on the Minneapolis system, and these will be watched with interest. It may be said that the officials of the Boston Elevated Railway Company have in mind some modification of the foreign double-deck car as one of the possibilities, although perhaps a remote possibility, in affecting a solution of the problems arising from the need for increased seating and carrying capacity on the congested city lines.

The third solution suggested, namely, the running of surface cars in two and three-car trains, is now receiving a thorough trial in Boston. The Boston Elevated Railway Company has recently purchased forty Brill semi-convertible cars fitted with a new system of multiple-unit control that has been worked out by the General Electric Company. The system provides for automatic acceleration, but is somewhat simpler than the multiple-unit control in general use for elevated and subway work. The cars are equipped with a new Westinghouse automatic braking system which embodies several new features, particularly with reference to adapting the brake for ordinary surface cars.

In considering the possibilities of running surface cars in two and even three-car trains, the Boston company made a careful study of the possible combinations. These resolve themselves down to three practical arrangements. It is possible to place the four motors on one car with the master controller on one or both ends of the motor car and running the second car as a trailer, pure and simple. This, of course, would involve building loop or Y terminals for all lines, in order to avoid shifting the trailer at the ends of the runs.

Another possibility was to put the four motors on one car, but have master controllers on the trail car as well as on the motor, so that the train could be controlled from either end.

A third solution, and the one that was ultimately adopted, is to put two motors on each car of the train and have master controllers on the front and rear end of the train, so that it may be run in either direction without more trouble than is involved in changing controller handles. It is probably true that the cost of maintaining motors when they are distributed two to a car will be somewhat greater than if the four motors were placed on one car, but it is believed that this slight disadvantage is more than offset by the advantages gained in the arrangement as finally adopted.

Concerning the latest type of car for elevated service which has been described in these columns, it can be stated authoritatively that the company is entirely satisfied with the results, and the work of changing over the older elevated cars to the new design is now under way. This will include the vestibuling of all the old elevated cars, taking out the inside doors, adding sliding and side doors and operating all doors by a pneumatic device.

An experimental car is being built for the East Boston tunnel with folding end compartments for the motorman, and will be out of the shops within a few weeks, at which time a complete description of the details will appear in the STREET RAILWAY JOURNAL. The car is designed for service on the surface lines as well as in the tunnel, and as soon as the various minor details have been thoroughly tried out similar cars will be built for regular service on certain of the lines. It is not claimed that the new East Boston tunnel type of car is absolutely fireproof, but it is believed it possesses sufficient fire-resisting qualities to insure a high degree of safety in operation.

The New Orleans Railway Company has issued a neatly printed booklet containing views of the special electrical illumination of New Orleans during the Mardi Gras Carnival on March 7, made under the direction of the company. The halftones show principally the exteriors of the various social clubs; Canal, St. Charles and Royal Streets, which were illuminated with electric streamers through the co-operation of various committees appointed by the Mayor, and of the City Hall, the St. Charles Hotel and the establishments of several enterprising firms. This beautiful display was the subject of much favorable comment from the visitors to the city, and strikingly illustrated to everyone the magnificent effects which may be produced by artistically designed electrical exhibitions.

TEST OF A 5000-KW. ALTERNATOR*

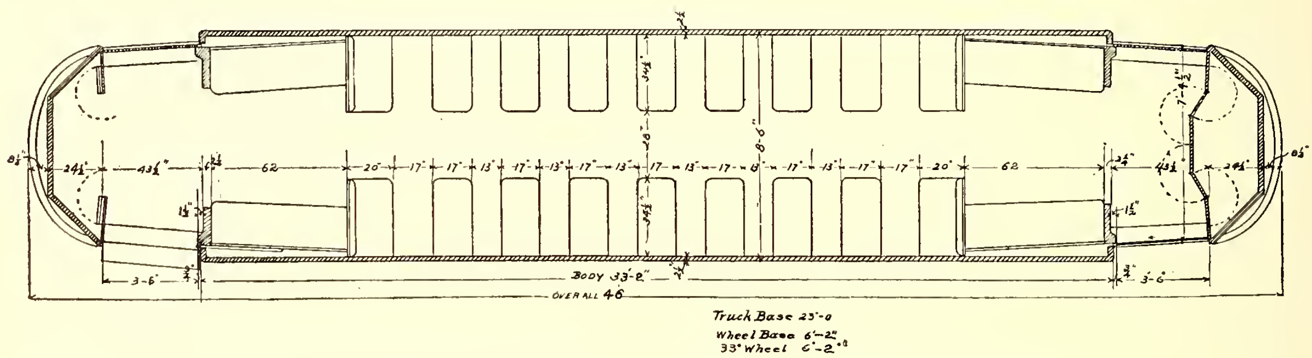
BY L. L. GAILLARD,
Formerly Electrical Superintendent with the Interborough Rapid Transit Company, New York

The following paper is intended to give a general description of the series of tests made on each of the alternators installed in the Seventy-Fourth Street (Manhattan) power station of the Interborough Rapid Transit Company, of New York City. The object of the tests was to obtain characteristic curves of the machines and to determine how nearly they conformed to the contract requirements and the manufacturer's guarantee.

Each machine is a 5000-kw, 11,000-volt, 25-cycle, 75-r. p. m. Westinghouse alternator, direct connected to a double horizontal-vertical Allis compound engine.

It may be well to preface the account of the tests with the following extracts from the contract specifications giving certain data obtained from the calculations of the manufacturer, and certain guarantees upon which was based the acceptance or rejection of the machine by the purchaser:

A guaranteed full-load efficiency of 96.5 per cent, to meet which guarantee the total permissible losses in the alternator are therefore 181,300 watts.



PLAN OF THE EXPERIMENTAL CAR FOR THE EAST BOSTON TUNNEL

The full-load field current equals	202.	amps.
The full-load armature current equals	263.	amps.
The armature copper loss equals:		
$263^2 \times 0.4$ equals	27667.	watts.
The field resistance equals	0.85	ohms
The resistance of the armature equals	0.4	ohms
The field copper loss equals:		
$202^2 \times 0.85$ equals	34683.	watts.
Total copper losses equal	62350.	watts.
Total allowable iron losses, based on 96.5 per cent full-load efficiency, equals	118950	watts.

The efficiency on non-inductive load will be:

At one-quarter load equals not less than	90.00 per cent.
At one-half load equals not less than	94.50 "
At three-quarters load equals not less than	95.50 "
At full-load equals not less than	96.50 "
At 25 per cent overload equals not less than	97.00 "

The efficiencies are based on I^2R loss in the armature and field coils and on the armature iron loss. Friction is not included.

The current in the armature when short-circuited with normal no-load field current, will equal three times full-load current.

The regulation at 100 per cent power factor will equal 6 per cent.

After running for twenty-four hours at full-load at 100 per cent power factor, the rise in temperature in no part will exceed 35° C.; and at 25 per cent greater load, with the same power factor, for twenty-four hours, the rise in temperature will not exceed 45° C.

The following measurements and tests were made on the alternator:

Measurement of armature iron loss.
Resistance of armature winding.
Resistance of field winding.
I^2R loss in armature.
I^2R loss in field.
Efficiency at various loads.
No-load saturation curve.

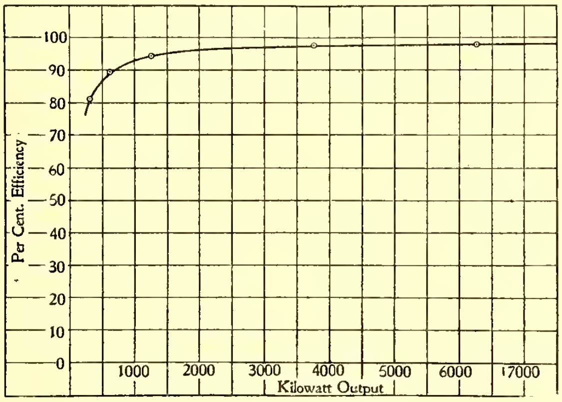
* Abstract of a paper presented before the Electric Club, of Pittsburg, and appearing in the Electric Club "Journal" for May, 1905.

Short-circuit characteristic.
Regulation (calculated).
Insulation puncture test.
Temperature rise under load.

Armature Iron Loss.—It being entirely impracticable to measure this loss in the usual manner, the iron losses were determined from a measurement of the losses in sample rings made from the material of which the armature was built up. These samples were annealed in the ovens with the armature laminations, were painted the same as these laminations, and then built up into test rings and compressed until their volume contained 90 per cent solid metal. The rings were then wound for test purposes and the losses at the different inductions were measured with a sensitive wattmeter.

From tests on these samples the total watt loss in the armature was calculated to be 38,693 watts.

The impracticability of making an accurate determination of the iron losses after the machine had been assembled is to be regretted, as the method adopted and just described contains probabilities of error which cannot be pre-determined or eliminated. The armature casting is made in six sections and



EFFICIENCY CURVE OF 5000-KW ALTERNATOR FOR VARIOUS LOADS

the sheet steel laminations are each no greater than 6 ft. in length, thus making in the magnetic circuit six butt and numerous lap joints. The losses due to these breaks in the magnetic circuit are, of course, neglected when the determination of the iron losses is made in the manner just described, but it is probable that they are of so small a value when compared with the total losses as to be negligible.

Resistance Measurements of Armature and Field.—These measurements were made by the usual drop-of-potential method, the temperature of the winding and of the room being observed. The resistance as measured were then calculated for a room temperature of 25 degs. C. and the I^2R losses calculated on this basis.

Resistance of armature:

Phase 1—2 R = 0.2325 ohms at 25° C.
" 2—3 R = 0.2332 "
" 1—3 R = 0.2329 "
2 times combined resistance of three phases =
0.2325 + 0.2332 + 0.2329 = 0.6986.
Total armature resistance therefore equals

$$\frac{0.6986}{2} = 0.3493 \text{ ohms.}$$

Resistance of field at 25° C. = 0.8206 ohms.

Efficiency.—As noted above, the efficiency is based on the armature iron losses and the field and armature I^2R losses. The iron losses were determined as described above, and from the resistance values as obtained by measurement, the I^2R losses in field and armature have been calculated for various loads from 25 per cent to 125 per cent of full rated load. These appear in tabulated form below, and the accompanying curve was plotted from the calculated efficiencies.

In calculating the field I^2R loss, 208.1 amps. was used as full-load field current, this value being obtained in the following manner:

Field current corresponding to terminal voltage on open circuit plus armature resistance drop, equals...........	198.5 amps.
Field current necessary to give full-load armature current or short-circuit, equals...............................	62.5 "
Full-load field current is the vector sum of above, or.......	208.1 "

	¼ Load	½ Load	¾ Load	Full Load	1¼ Load
Iron loss, kw.......	38.69	38.69	38.69	38.69	38.69
Armature I^2R loss, kw	1.51	6.04	13.59	24.16	37.75
Field I^2R loss, kw...	35.54	35.54	35.54	35.54	35.54
Total losses, kw.....	75.74	80.27	87.82	98.39	111.98
Output, kw	1250.	2500.	3750.	5000.00	6250.
Input, kw..........	1325.74	2580.27	3837.82	5098.39	6361.98
Efficiency, per cent..	94.29	96.50	97.71	98.06	98.24

Insulation Test.—The contract specifications required that after the machine had been assembled the insulation of the field winding from the frame should be subjected to a puncture test of 2500 volts alternating electromotive force for a period of one minute, and that the insulation of the armature winding from the frame should be tested at a potential of 25,000 volts for thirty minutes.

As the armature coils had been exposed to moisture for some time before being assembled, it was thought advisable to give them a drying out before subjecting them to the puncture test. For this purpose the armature was short-circuited and the machine run at about two-thirds full speed, with sufficient field current to give about 500 amps. in the armature. This heat run was kept on for about sixty hours, then the machine was shut down and the windings carefully wiped off and allowed to cool to the temperature of the room before the insulation test was made.

The insulation tests were made by using a 250-kw, 40,000: 360-volt, 25-cycle, oil-cooled transformer, the low-tension winding of which was connected in series with a water rheostat, to the 400-volt, 25-cycle station bus-bars. The potential on the high-tension side of the transformer was measured with a 50,000-volt electrostatic voltmeter which had been previously calibrated.

It may be of interest to note that when the test potential was first raised to 25,000 volts, and for some minutes thereafter, a considerable static discharge was noticed taking place over the surface of the windings. As the test was prolonged, this static discharge gradually decreased in intensity until after the lapse of about twenty minutes it almost entirely disappeared.

Regulation.—The specifications for this machine provide that "a load of 263 amps. per terminal at 11,000 volts electromotive force and at 100 per cent power factor may be thrown off, and the electromotive force will rise 6 per cent with constant speed and constant excitation."

It has not been found convenient to make an actual measurement of the regulation of the machine, but from the data and characteristic curves it has been calculated. This calculation was made by the usual magnetomotive force method and the regulation was found to be 4.5 per cent. This figure is undoubtedly too small, as this method of calculation invariably gives results more favorable to the machine than those obtained from actual test.

Temperature Measurements.—A number of determinations of the temperature rise in field and armature conductors and in armature laminations were made after the machine had been running under load for a sufficient length of time to have reached a constant temperature.

The following results represent the average rise in temperature above the surrounding air of the various parts of the machine after a run of seventeen hours at an average load of 5000 kw:

Temperature rise above air:
Field winding....................22.5° C.
Armature winding...............22.6° C.
Armature laminations...........25.5° C.

The performance of the eight alternators, of which this one is representative, has been so excellent and the temperature so greatly below the guarantee, that their rating has been increasing from 5000 kw to 6000 kw.

Testing Synchronizing Connections.—After the first machine had been installed it became necessary to make sure of the correctness of the synchronizing connections of each of the others as it became ready for operation. For synchronizing, dark lamps and a dial synchronizer are used.

To make an absolutely certain test of the synchronizing connections, the following interesting method was adopted: When the second machine was ready for service, the main switches of both Nos. 1 and 2 were closed, tying the machines to the bus. Full-load field current was put on each alternator and both engines were started simultaneously and slowly brought to full speed together. If the lamps remained dark and the synchronizer indicated exact synchronism, no better check could be had on all connections. Had there been any wrong connections in the armature circuit of one machine, making a short-circuit when the two machines were tied together, this would have been indicated on the ammeter in the armature circuit immediately after the machines started. The relay would also have operated immediately to open the armature switch.

After the two machines had been brought to full speed (tied together) they were then cut apart and synchronized in the usual manner. This method was used with great success on all the machines, a separate bus-bar being used for the purpose.

FOR RECORDING REGISTER READINGS

As a means for obtaining accurate daily records of register readings in all its cars, the Public Service Corporation of New Jersey is using a "Daily Car Record," herewith reproduced. The record blank is a card 8⅜ ins. x 5¼ ins., and one of these is placed in each car every morning in a small metal rack provided for the purpose. Before the cars leave on their first runs the depot starter takes the reading of the register in each car and enters the figures on the top line of the card, under the heading "Register commencing." This card remains with this particular car for the entire day, irrespective of changes in crews, routes or schedules. Each conductor who may happen to run with the car during the day is required to enter the totalizer register reading when he takes the car and when he leaves it. It will be evident that this system insures accuracy in keeping the total registrations for the day, inasmuch as each conductor, for his own protection, must see that the reading entered by the previous conductor tallies with the reading as entered for the beginning of his own run. The system also obviates the necessity for having inspectors or starters take the register readings at every change of crews, as the conductors do their own entering, and under conditions which give an absolute check. Of course, the conductors also enter the register readings on their day cards, and in the auditor's office the daily car records are checked very carefully with the conductor's day cards, thus giving a double checking. Moreover, the depot starter enters in a book the totalizer reading in the morning before the car starts out and again at night when it is turned in, and the total registrations must, of course, tally with the entries on the daily car records, thus giving an additional safeguard.

The system of register cards is extended to include every car owned by the company in which there is a register, whether the car be in service or in the shop or in storage. The repair shop men are required to make the entries on the corresponding card for all registrations they may make when testing or repairing registers.

It will be understood that by assembling all the register cards from the entire system for each day it is possible to determine the aggregate number of registrations made for the day on all the registers owned by the company. For these aggregate readings there must be some corresponding check or explanation, either in the way of cash fares or tickets, or a record of non-revenue registrations made by shop men. This facility for accurate verification gives the auditing department a very valuable check on the operation of registers for the entire system.

At the bottom of the register card, under the column rulings, are printed the following instructions:

INSTRUCTIONS TO CONDUCTORS

Indicate by filling in the above blank the time and register reading when you take this car, and the time and register reading when you leave this car, also your badge number. If there is any difference in your reading of the register and the previous reading, call the attention of the officer in charge. In the absence of any officer, please call the attention of witnesses, giving their names and addresses, and note the same on your report.

INSTRUCTIONS TO CAR HOUSE MEN

Stamp in route. Record the register reading on this blank when the cars come in the car house at night, and record same reading on the blank for the next day. Next morning send all car records for cars in use and those not in use, in the bag to the general auditor. On sending or receiving a car, note the route from which it was received or to which it goes, and note the register reading, and in the same way note any change in the register by recording the number of the register.

In making entries on car record, use the blank line nearest the top of the page, giving the route and register reading, and sign your name at the end of the line.

INSTRUCTIONS TO SHOP MEN

You are instructed to record on this blank the register reading when you receive this car, and also the register reading when you dispose of it, and sign your name.

GENERAL INSTRUCTIONS

Any defect in the register must be reported by any employee at once in writing to the division superintendent. Note the same on this blank and sign.

DAILY CAR RECORD.

Date.................... *Car No.*

Register No........... *Route*....................

TIME.		Reg. Commencing.	TIME.		Reg. Ending.	Badge No.
A. M.	P. M.		A. M.	P. M.		

REGISTER RECORD BLANK, PUBLIC SERVICE CORPORATION

The Illinois Central Railroad has announced a reduction of nearly 100 per cent in passenger fares between Chicago and Kankakee, Decatur and Bloomington. The object is to meet the competition of the electric railways. The trains are to consist of an engine and passenger coach, no baggage to be carried and stops are to be made not only at regular stations but at cross roads.

ELECTRIC TRACTION*

BY VICTOR TREMONTANI,
Chief Superintendent and Manager, Electric Department Italian-Mediterranean Railway

The author was assigned to discuss the development of electric traction on railroads in countries other than America, France, Great Britain and Belgium.

The most typical installations of electric railways made since 1900 are those of the Milan-Varese-Porto Ceresio line built by the Italian Mediterranean Railway Company, and of the Lecco-Sondrio-Chiavenna by the Italian Adriatic Railway Company. Apart from these two experiments, which, both from their importance and their boldness, will always form a landmark in the technical history of railways, very little, in fact hardly anything, has been done in the countries with which this report deals.

ADVANTAGES AND DISADVANTAGES OF STEAM AND ELECTRIC TRACTION

In order to carry passengers at a speed of 62 m.p.h., about half the power of the steam locomotive is used to drive itself, and only the other half is used to haul the train. In the case of steam traction there is thus at present the double difficulty of increasing the speed of the locomotive, while at the same time increasing the weight of the trains; this difficulty steam locomotives do not seem able to overcome, although many improvements have of late been made in them.

The great speed which a locomotive (owing to the great vibration caused by the reciprocating movements) could not give in practice without an enormous expenditure of power can easily be obtained by a system of electric traction, and this is proved by the results obtained, not only in the Marienfelde-Zossen trials, but also on the other electric railways. A speed of 62 m.p.h. may now be looked upon as practicable with electric traction. On the Milan-Varese line, in a trial, a speed of 77 m.p.h. has been attained, running smoothly on a weak track, which would not have stood a speed of 49.7 m.p.h. in the case of trains hauled by steam locomotives. Thus the electrification of a line makes it possible to increase the speed without altering or strengthening the track, and the latter operation would involve a heavy expense on nearly all the railways having rails of medium weight supported on a small number of sleepers.

A steam locomotive to haul fast trains must have a very great weight, which has many disadvantages; in the case of electric traction, however, the weight of the motors is much less and can in no way be compared with that of its rival. Moreover, the electric locomotives, and still more the electric motor cars, which are of a much simpler construction than the steam locomotives, require no tender or special installations in the stations or along the lines, for the supply of water; moreover, they can easily run in either direction, so that turntables are not required.

The average distance run by a steam locomotive is only 56 miles per day, whereas electric cars can run 298 miles per day; a steam locomotive requires at least three-quarters of an hour's attention before it starts and after it has completed its run, whereas electric locomotives and electric cars only require a few minutes for this purpose. All this shows that electric traction makes it possible to operate a line with a smaller number of locomotives, and hence results in economy, not only in the first cost, but also in the working expenses; maintenance and renewals cost less than with steam traction. In connection with the working expenses it must not be forgotten that electric traction makes the paint and the upholstering of the carriages last longer, reduces the cost of the staff (maintenance and train staff), the cost of maintenance of the rolling stock and of the permanent way, and facilitates the lighting of the stations and of the trains.

Electric traction entirely does away with smoke, and this is a very valuable quality in the case of long tunnels, because the signals will always be visible and it will be possible to divide a tunnel into several block sections in order to increase the carrying capacity of a line which, in certain cases, has reached its limit with steam traction.

As regards the acceleration, it may be said that a steam locomotive cannot keep up a uniform acceleration for more than a few moments, whereas an electric motor satisfies to a remarkable extent all the desiderata of a tractive motor, and these may be summed up in the following words: Absence of noise, smoke, smell, sparks and cinders; great torque, rotary movement, small weight, power variable within very wide limits, possibility of obtaining the acceleration desired.

It has been proved that the superiority of the electric motor lies chiefly in the fact that the tractive effort is more continuous than in the case of a steam locomotive, that the adhesion is utilized better in the case of electricity and that electric trains always give a higher mean speed for lower maximum speed, and consequently less energy is consumed than in the case of steam-driven trains.

The adoption of electric traction also makes it possible to replace the existing fast and express trains, which are of considerable weight, by a larger number of quicker and lighter trains, consisting of one or two auto-motor cars and some trailers. Now this increase in the number of trains will certainly result in increased traffic, owing to the greater facilities it will give the public and to the time it will save. The subdivision of heavy trains into light trains, which would be impossible with the existing system of traction, as a numerous staff would be required, would cost but little in the case of electric traction, where a train would require two men only—a driver and a conductor—who also know how to operate the apparatus.

COST OF FUEL, OR COST OF ENERGY

Concerning data on the consumption of coal on the Milan-Varese-Porto Ceresio line after the introduction of electric traction, the author is able to state that experience shows that on an electric railway operated under similar conditions (as regards gradients and working), the energy consumed by a train having a useful weight of 197 English tons running on the flat at a speed of 56 m.p.h. amounts to 49 watt-hours per English ton-mile—that is, 9.66 kw-hours per train-mile. Now, in order to obtain this on the electric train, it is necessary to burn at the central generating station, on the average, $2 \times 6 = 12$ kg of best quality coal per train-kilometer (42.58 lbs. per train-mile), losses in the mains, transformers and motors being allowed for.

In the case of steam traction, such a train, having a useful weight of 197 English tons, must necessarily have a total weight of 276 English tons, and various statistics consulted enable the writer to state that the steam locomotive of this train, running at a speed of 56 m.p.h. on the level, would burn 63.86 lbs. per mile.

Thus, in the case of electric traction, there is a great saving not only in the consumption of energy, owing to the better utilization of the weight, but also in the amount of coal required for driving the train.

COST OF MAINTENANCE OF ROLLING STOCK AND APPARATUS

In this connection, the observations made on the lines of Milan-Varese-Porto Ceresio, Lecco-Colico-Sondrio, Bergdorf-Thun, etc., lead to the conclusion that the cost of maintenance of rolling stock is less than on similar steam lines, and as this maintenance costs less, it may be added that it is simpler, more quickly carried out and consequently less costly, and that less extensive repairing shops will be required.

*Abstract of paper read at International Railway Congress, Washington, May 11, 1905.

COST OF LUBRICATION, OF CLEANING AND OF STAFF

The observations made enable the author to affirm that the cost of lubrication is less with electric traction than with steam traction, and that the absence of smoke results in an important reduction in the cost of cleaning. Finally, the staff required on the train can be reduced in the case of electric traction to two employees—one for driving and the other for the train, as it is possible to replace the driver and the fireman by one wattman, or motorman, who does not need to go through a long and complicated apprenticeship (as required in the case of steam traction), and who consequently can be paid at a much lower rate.

COST OF MAINTENANCE, RENEWAL AND SUPERVISION OF TRACK

Experience has proved the truth of what was theoretically expected in this connection, namely, that electric traction is cheaper than steam traction as regards track expenses. In fact, if there be taken into account in the case of electric traction, the maintenance and renewal of the appliances at the transformer sub-stations and of the third rail or other conductor, there are per contra no expenditure for constructing and maintaining installations for supplying water to the boilers, and what is more important, the maintenance of the track is reduced. There is no doubt that with electric traction the track is subjected to less wear and tear than with steam traction, because there is no jumping, pitching or sideway oscillation, and hence the weight can be more evenly distributed over the wheels; also because the tangential force on the rails is smaller and more regular with electric locomotives and cars; all these advantages evidently result in a material reduction in the cost of maintenance of the track.

The technical and financial advantages mentioned, which result from the application of electric traction on railways, are worth the attention of those operating lines, and the observations made by the author lead him to believe that at present a large number of steam lines would profit by being electrified. Certainly in making the choice and in the economic consideration of the question, it is necessary to take into account the cost of transformation, and the additional charges for amortisation must not be neglected; but if the fact that the electrification of an existing line may result in a large increase of the gross receipts is taken into consideration, we shall often be surprised to find that electrification can be effected with great advantage.

The example of certain electrified railways—e. g., that of the Milan-Varese line, which is a typical case—proves that in spite of the heavy cost of electrification, and in spite of the generation of the electric current by means of steam engines, a very considerable net profit is obtained in comparison with the old system of traction, a profit which will be increased still more if it becomes possible, as it is hoped, to use water power.

The author then briefly compares the three different methods of utilizing electric traction, namely, continuous current, polyphase alternating current and monophase alternating current, and describes the advantages and limitations of each.

In closing, the following conclusions are presented:

I.—GENERAL FEATURES

Electric traction offers a number of advantages of a technical nature, in working and in economy, over the existing methods of steam traction, and, although—to judge by the limited number of practical trials made up to the present—the problem does not appear to have been solved completely and finally (except in certain special cases—metropolitan, suburban and mountain railways), the question of this new and seductive method of traction to large railways is worthy of serious investigation, not only in the case of companies working metropolitan lines and those working the suburban traffic of some of the large provincial towns, but also of the others, and more particularly those which have to meet the fierce competition of electric tramways.

The application of electricity to the traction of railway trains is now a necessity and requires to be seriously investigated and applied, particularly in the case of those countries—like Italy and Switzerland—where coal is dear, and where, on the other hand, there are abundant natural sources of supply of energy.

II.—THE ELECTRIC SUPPLY SYSTEM TO BE ADOPTED

In the present state of science it appears probable that electric traction on railways proper will only be possible practically by the use of current generated by stationary plant at central stations, transmitted to the locomotives by insulated conductors laid along the permanent way and utilized in the motors on the train. This is now rendered more easy by the advance which has been made in high tension generation, distribution and conversion, currents at 60,000 volts being now generated in several stations, enabling any amount of electric energy to be conveyed with certainty, ease and economy to sub-stations up to a distance of 400 kilometers (249 miles), so that it would now be possible to supply a line of railway 400 km in length from a single generating station.

The continuous-current system has been thoroughly tried, and its use in traction on railways has demonstrated its excellent qualities of large range of load (great acceleration) and elasticity; it is to be preferred where it is a question of a railway with heavy passenger and goods traffic, and where a frequent and quick service is required.

The three-phase current system is complicated, and has the disadvantage of loss of a considerable amount of energy in the resistances when starting.

A great movement in favor of the single-phase system has taken place during the last few years in Italy and in Germany, and is spreading little by little also in America. This last system is theoretically better than the preceding, and, although the applications of the single-phase motor to railway traction are but in their infancy, it may be definitely stated that in them will be found the solution of the problem for light railways and for those lines which run into towns where this motor can also utilize the continuous-current supply.

III.—FROM THE SERVICE POINT OF VIEW

In the first place, it must be borne in mind that the ideal traffic for passengers is that obtained by a service similar to that on tramways, but at high speed—that is to say, that the existing trains which start at intervals of several hours should be replaced by light trains running at short intervals. Now, in order to obtain greater speed for the existing trains, the steam locomotive cannot be used, as it has nearly reached its limits of economy and power, and we must turn to the electric motor, which can easily give the extreme speeds at present in demand for express trains. To obtain the frequent service desired by the public, steam trains cannot be multiplied without largely increasing the working expenses, whereas with electric traction the increase in number of the trains entails but small additional expenditure.

With the adoption of electric traction on railways a new service should be commenced with frequent fast trains of smaller size. The ideal with electric traction is the automotor vehicle itself forming the whole train.

The reporter is of opinion that the following conclusion may be drawn: That in the future trains of great length will no longer be run (except for long distances), and that numerous short trains will be run instead. This result will in a great measure depend on the advances made in electric technology, but even now the possibilities of electricity and of its mode of transmission are realized as affording several good solutions, none of which can be regarded as final, but all of which have their advantages according to the mode of application and to local conditions.

ELECTRIC TRACTION IN GREAT BRITAIN AND BELGIUM

The paper on this subject at the International Railway Congress at Washington was presented by Ernest Gerard, Inspector General of the Ministry of Railroads, Posts and Telegraphs of Belgium. The report is divided into two sections, one dealing with the electrification of steam railways in the countries named and the second to the use of electric automobile cars on sections of steam roads where there is little traffic, and where it is more economical to use lighter rolling stock, consisting of individual units, which can stand idle in the interval between two successive trains without costing anything except for the time of the crews.

Taking up the question of electrification of steam railroads in Great Britain, the author at the outset gives considerable space to a paper presented by Prof. Carus Wilson at the Engineering Congress held at Glasgow in 1901, in which were discussed in great detail the comparative costs of working railroads by steam and by electricity. From that paper the present author quotes the following as the comparative cost under assumed typical conditions of operating as follows: Total operating expense per train-mile for steam, 11.85d. (23.70 cents); for electricity, 4.89d. (9.78 cents).

The conclusion is reached that where there is sufficient traffic for a number of short trains, electric traction is relatively profitable. This truth is now generally agreed to. But the agreement was not arrived at without trouble and much experimenting. The author then proceeds to describe the various installations of electric traction on English railways. The lines treated with the length of track electrified are as follows:

The Lancashire & Yorkshire Railway (Liverpool-Southport), 47.3 miles.

Mersey Railway, 12 miles.

Metropolitan Railway of London, 59.7 miles.

Metropolitan District Railway, 68.4 miles.

North-Eastern Railway (suburban lines north of the Tyne), 82 miles.

All of the systems have been fully described in the Street Railway Journal, as follows: Lancashire & Yorkshire, issues of Jan. 30, 1904, and April 2, 1904; Mersey Railway, issue of April 4, 1903; Metropolitan of London and Metropolitan District, issue of March 4, 1905; North-Eastern Railway, issue of June 20, 1903.

All these lines are of standard gage and their profile does not show any peculiarities which would distinguish them from any other suburban lines with moderate grades and curves of medium radii.

All of the lines take current from a third rail alongside the track rails, but on four of the systems there is also a fourth rail which is used either with or without the track rails for carrying the return current. There is one common feature which applies to all these companies, and that is the relative position of the surface of the positive rail from which the shoes take the current, and of the rolling surface of the track rail. An agreement has been reached between all the English railways that in view of the possible extension of electric traction to lines over which the rolling stock of several companies runs, the upper surface of the third rail should be placed exactly 3 ins. higher than the rolling surface of the nearest track rail, and that its center should be 3 ft. 11½ ins. from the axis of the track.

On the Liverpool-Southport line the third and fourth rails are of T-section, 60 ft. in length, and weighing 70 lbs. per yard. The positive rail is generally laid in the 6-ft. way and supported on insulators of artificial stone. The fourth rail, or negative rail, is supported on wooden blocks placed between the track rails. The top of the fourth rail is ¾ in. lower than the rolling surface of the track rails. One advantage of the fourth rail is that it avoids the necessity of electrically bonding the track rails. Another advantage is that it is possible to repair the track and to replace any track rail without breaking the return circuit. In order to prevent anybody from accidentally touching the conductor rail at stations, at level crossings, on bridges, etc., it is protected by longitudinal pieces shaped to fit the cross section of the rail. At crossings, where the positive rail is broken, the ends are sloped gently downward so as to facilitate the passage of the shoes, and are painted red in order to warn passers of danger. The public is also warned by notice boards placed near the rails.

The same third and fourth rail system has been adopted by the Mersey Railway as well as by the Metropolitan Railway and the Metropolitan District Railway, but with the essential difference that the fourth rail, or return rail, is also laid on insulators and not on wooden blocks, and is not bonded to the track rails which are independent of the circuit on the line; however, the track rails as well as the negative insulated rail are connected to the negative bar of the main switchboard of the generating station, so that the track rail is practically at the same potential as the earth, and no one by touching it can receive a shock.

By adopting an insulated return central to the tracks the companies have complied with a demand of the Board of Trade in order to avoid the action of any stray currents on observatories, telephones, electric signals and the danger of any electrolytic action. The companies would have had to take measures necessary to provide for the due observance of the rule the suburban tramways have to obey, namely, that there must not be a greater difference of potential than 7 volts between any point of the line and the nearest point of the central station. It was found that it was cheaper to satisfy this condition by means of an insulated return rail with heavy copper bonds at the joints and insuring continuity of the circuit while avoiding the inconveniences and precautions of bonds between the track rails, the metal of which is weakened by frequent bending stresses, and which have to be temporarily replaced by cables when, in the course of repairs, any track rails are taken out.

POWER STATIONS AND SUB-STATIONS

The use of primary alternating current makes it possible to locate the power station at a non-central point favorably situated as regards cost of land, water supply and the handling of the fuel. Several of the companies have dealt with the question in this way, and their stations are not located near the centers of distribution. Two of the companies, however, the Lancashire & Yorkshire and the Mersey Railway, were able in each case to install their power stations sufficiently near the center of the electrified lines to justify calling them by the old name of "central stations." These two companies also use ordinary reciprocating steam engines with large fly-wheels, whereas the others have preferred steam turbines.

ROLLING STOCK

The five companies under consideration have adopted some similar principles in the construction of cars and in the way the trains are made up. (For comparisons of these and other English cars see article by John P. Fox, in the Street Railway Journal for April 1, 1905.)

All the roads run trains equipped with multiple-unit control, and trains can be operated from either end. Except on the Lancashire & Yorkshire Railway, the seating is arranged in a way which is an innovation in Europe—that is, a very wide space is left between the longitudinal seats, affording standing room for a large number of passengers. On all the roads trains are fitted with automatic air brakes with electrically-operated compressors, the only exception being the trains of the Mersey Railway, on which the air brakes are operated from storage tanks carried on the cars, and which are charged at convenient points.

The number of cars to a train and the method of electrical control differs on all the roads.

FINANCIAL DATA

Only two of the electrified lines were in working order at the time the report was made—that is, the Liverpool-Southport line and the Mersey line. The work on the North-Eastern was being organized while the two London lines were still in the constructional stage, and therefore comparisons as to increase in traffic due to electrification and operating costs are rather unsatisfactory, although the report contains numerous tables giving traffic and financial statistics for varying periods.

The report next reviews at great length the results of the many experiments carried out by the different lines before they selected the particular types of construction and methods of operating which each considered best suited for its own conditions.

The use of auto-motor cars on light traffic lines by steam roads in Great Britain and Belgium is briefly referred to and descriptions of the principal types of propulsion are included.

In finishing his report, the author makes the following conclusions:

ELECTRIFICATION OF STEAM ROADS

In England, on the lines where electric working is now in operation, the electrification is attended with an increase in the number of trains and, consequently, in the facilities offered to passengers. The results obtained show that this is followed by an immediate increase in the number of passengers and in the receipts, with a material decrease in the cost per train-mile, with an increase in speed, a considerable increase in comfort, particularly in tunnels, and that this forms an attraction which has a serious influence on the number of passengers carried. The danger to people who have to move about in the neighborhood of the third rail, and the dangers which result from short-circuits, can easily be avoided.

AUTOMOBILE CARS

In so far as it is a question of trains at rare intervals, on sections where there is no advantage in increasing the number of trains, automobile cars make it possible to realize some economy as compared with trains hauled by steam locomotives; electric automobile cars have the advantage that the speed can easily and readily be controlled with great simplicity and certainty from either end of the car without any necessity for turning the car around. Experience will show whether accumulators or dynamos driven by petrol motors give the better results.

ELECTRIC TRACTION IN AMERICA

A paper summarizing the results secured on the electrical divisions of steam railroad companies in America was presented at the International Railway Congress in Washington, May 11, by W. D. Young, the electrical engineer of the Baltimore & Ohio Railroad.

To obtain the information desired, the author prepared a set of 209 questions, which were forwarded to 222 railroads, from which 171 replies were received. Of the 171 replies, eight were from steam railroads that were using electricity, and the author's paper is based on the information contained in these eight answers.

The eight replies concerned the following lines:

The belt line of the Baltimore & Ohio Railroad Company.

The trolley lines at Concord, N. H.; the interurban line from Concord to Manchester, N. H., and the city and suburban lines at Portsmouth, N. H., all of which are owned by the Boston & Maine Railroad.

A short trolley line owned by the Chicago, Burlington & Quincy Railroad.

The Wellston & Jackson Belt Railway, operated by the Hocking Valley Railroad.

The trolley lines on Long Island controlled by the Long Island Railroad.

The trolley lines and third-rail divisions operated by the New York, New Haven & Hartford Railroad.

The suburban lines of the North Shore Railroad of California.

The West Jersey & East Shore division of the Pennsylvania Railroad.

The questions and replies are tabulated in an appendix, practically all of the information contained in which has been published in the Street Railway Journal, to which reference may be made as follows: Baltimore & Ohio Railroad, issue of March 14, 1903; Boston & Maine Railroad, issue of Dec. 6, 1902; the New York, New Haven & Hartford Railroad, various issues; North Shore Railroad, issues of Jan. 2, 1904, and Jan. 9, 1904.

The author compares the information received from this canvass with a report read by N. H. Heft before the International Railway Congress in 1900, and states that the following facts are to be observed:

Firstly, that the larger roads that have interested themselves in the use and development of electric traction have increased in number from three to eight.

Secondly, the miles of track operated has correspondingly increased from 81.2 miles to about 172 miles.

Thirdly, there are special cases noted where the speed has increased from a maximum on the level to 40 m.p.h. to 48 m.p.h.

Fourthly, the load has not increased materially in the special case considered, namely, the belt line of the Baltimore & Ohio, although there is a tendency toward increasing the train load, and to meet this condition the railroad company has purchased larger and heavier locomotives since the report of 1900 was made.

The writer states that unfortunately his report had to go forward at a time when there are very important developments in the application of electricity to steam roads about to transpire in America, and about which at the time little could be written. These developments refer particularly to the electrification of the New York Central terminal and suburban lines in and about New York as well as those of the Pennsylvania Railroad.

The balance of the report is devoted entirely to a description of the single-phase alternating-current motor as developed by the General Electric Company on the Ballston extension of the Schenectady Railway Company. The details of these developments as set forth in the report have been published widely in the columns of the technical press of this country, and are familiar to the readers of the Street Railway Journal.

REPORTED CONSOLIDATION OF OHIO AND PENNSYLVANIA PROPERTIES

It is reported that steps are pending for the consolidation of the various traction and lighting properties centering at Youngstown, Ohio, and Sharon and New Castle, Pa. These include the Pennsylvania & Mahoning Valley system, owned by Cleveland and Pittsburg interests, and the Youngstown & Sharon, Youngstown & New Castle, Sharon Street Railway, and the lighting plants in Youngstown, New Castle and Sharon, owned by New York interests. It is also reported that the Beaver Valley Traction Company and the Youngstown, Park & Fall Railway, of Youngstown, are being considered in the deal. The consolidation would embrace over 200 miles of traction lines, which, with proposed extensions, would give a continuous line from Leavitssburg, Ohio, to Pittsburg, Pa., including also the city lines in Warren, Niles, Youngstown, New Castle, Sharon and Wheatland, the electric lighting plants in these and neighboring smaller towns, together with the gas plants at Youngstown and New Castle. The fact that the two interests have parallel lines between Youngstown and New Castle is believed to have been largely instrumental in the talk of consolidation. At a meeting held in Youngstown a few days ago, the following were present: James Parelee, B. F. Miles, of Cleveland; M. E. McCaskey, J. M. Walker, J. E. McVey, J. T. Harrington and C. H. Aikens, of New Castle, representing the Pennsylvania & Mahoning Valley Railway; John B. Dennis, of Blair & Company, New York; O. B. Barnard, of the New York Trust Company; H. H. Porter and E. N. Sanderson, who constructed the Youngstown & Sharon Railway; W. W. Miller, Leighton Clakins, of New York; R. Montomery, W. H. Park, John P. Hazlett and others, of Youngstown.

INTERNATIONAL RAILWAY CONGRESS

The seventh convention of the International Railway Congress was begun at the New Willard Hotel, in Washington, May 3, by the registration of delegates. No official sessions were held on May 3, but the American Railway Appliance Exhibition on the Monument grounds was opened at 12 o'clock noon. The opening address was made by George A. Post, president of the committee of arrangements, who introduced Hon. H. B. F. Macfarland, president of the Board of District Commissioners, who welcomed the delegates to Washington. Mr. Post then introduced George Westinghouse, to whom had been assigned the honor of president of the Exposition. Mr. Westinghouse made a happy address, in which he referred to electric traction in the following way:

The new era of railway operations has dawned, with its many new problems. I refer to the growing use of electricity for the movement of trains. There have already been such demonstrations of the benefits to be derived from the substitution of the electric motor for the steam locomotive that it requires no great prophet to predict the extensive growth of electric traction upon the great railways of the world and the eventual replacement of the steam locomotive. Fortunately, the time element, which is such a controller of events, and the financial problems involved, will insure gradual development and extension of the use of electricity. With these changes have come vastly different engineering problems and new sources of danger, which should, and will, command and receive that attention which is essential to the surmounting of every difficulty as it arises.

Mr. Westinghouse, as president of the Exposition, then introduced Secretaries Morton and Taft, of the Navy and the War Departments, respectively; Hon. C. M. Lawrence, vice-president of the London & North-Western Railway, and Stuyvesant Fish, president of the American Railway Association, each of whom made an address. In the evening a dinner was tendered the executive committee of the International Railway Congress and other distinguished guests, at the Hotel Raleigh, by the American Railway Guild, at which Vice-president T. N. Ely, of the Pennsylvania Railroad, presided. At 11:30 in the evening a time signal was transmitted around the world from the exhibition grounds through the naval observatory. The speed of the message was indicated on a large diagram, at which the different telegraphic stations through which the message passed were indicated by incandescent lamps, and as the message was received the lamps were illuminated.

The opening session of the Railway Congress was held at the Hotel Willard, Thursday morning, May 4, at 11 o'clock. At the request of the Government, the Vice-President of the United States, Hon. Charles W. Fairbanks, welcomed the delegates. At his right sat Ernest Gerard, temporary chairman of the Congress, and at his left Mr. Weissenbruch, its secretary. Mr. Fairbanks' address of welcome was followed by an address in French by Mr. Gerard, after which Mr. Fish, as president of the American Railway Association, delivered a speech in which he gave statistics of the growth of the railways on this continent. He then announced the provisional presidents of the four sections, as follows:

Stuyvesant Fish, of Section I., Way and Works;

Theodore N. Ely, of Section II., Locomotives and Rolling Stock;

Sir George Armytage, of Section III., Working;

M. Perouse, of Section IV., General;

Ernest Gerard, of Section V., Light Railways.

The meeting adjourned at 12:45 p. m.

At the meetings of the sections permanent organizations were effected by the election of the following gentlemen for presidents:

Section I., Track, Julius Kruttchnitt, fourth vice-president of the Southern Pacific Railway;

Section II., Traction, Mr. Sauvage, chief engineer of the Western Railway of France;

Section III., Operation, H. T. Hodgson, vice-president of the Midland Railway of England;

Section IV., General, Mr. Heurteau, manager of the Orleans Railway of France;

Section V., Light Railways, Mr. de Leber, chief of the Department of Railways, of Austria.

In the afternoon, at the invitation of the American Railway Association, a trip was made to Mt. Vernon, by special steamboat. Music was rendered by a section of the Marine Band. In the evening a reception was tendered the delegates by the trustees of the Corcoran Art Gallery, assisted by the Commissioners of the District of Columbia.

At its meetings on May 5 and 6, Section I. discussed the subject of wood ties. Opinion varied as to whether it is desirable in warm countries to cover the ties with a layer of ballast. The general opinion appeared to be that while in warm and dry climates it might be advantageous to do this, in warm and humid climates the ties should be exposed to air and light. The conclusions adopted were as follows:

1. It is possible to use both hard woods and soft woods. The selection depends on individual conditions adopted.

2. It is advisable to have reasonably strict specifications and to exercise great care in accepting ties. The timber yards where the ties are prepared must be kept clean and free from decaying matter; ties after cutting up must be stacked above the ground so as to allow free access of air, light and heat.

3. The pickling of ties in order to increase their life is to be generally recommended. The selection of the antiseptic and the method of carrying out the pickling operations depend on individual conditions.

4. Not covering up the ties does not reduce their life. If they are not covered up, it is possible to see any defect at once, and if necessary remedy it immediately.

5. It is important to combine great strictness when accepting ties with great care in selecting the ballast; the latter must be permeable, must be capable of being well packed and the packing well maintained, and give good adhesion between the tie and its seat. As far as this is concerned, the measures which are best for the preservation of the wood are also best for the stiffness of the track.

6. In order to prevent any contamination of the ballast, and at the same time help to preserve the tie, one cannot recommend too highly the careful drainage of the roadbed, in order to insure that any water runs off properly.

The question of the preservation of ties by the use of creosote was then considered. By "creosote" is understood an oil of tar containing from 10 per cent to 25 per cent of naphthaline and about 67 per cent of phenol. These proportions were approved as being the most desirable.

Section III. on May 5 discussed the handling of baggage, and there was a lively debate between the European and American delegates as to the relative merits of the American system of checking the baggage as compared with the European system of not checking. The section finally concluded that "the arrangements adopted in the different countries best meet their varied requirements, and that there are no grounds for recommending any particular system."

On May 6 the section discussed the subject of suburban traffic, and a paper was read on this subject by A. W. Sullivan, general manager of the Missouri Pacific Railway and designer of the Illinois side-entrance cars. His conclusions were as follows:

To be in the highest degree remunerative the traffic must be handled rapidly, by simple and inexpensive methods, and with the minimum working organization necessary for the purpose; the type of car is the essential factor; new lines to be constructed should be adapted to the best types of cars. On old lines, in order to utilize to the utmost the space between tracks; the curves should then be compensated to provide the same clearances as upon tangents; the locomotives should be sufficiently powerful to haul trains of maximum size at the speeds required; the train schedules should provide for the movement of all trains at a uniform speed and stopping at all stations upon the same tracks; separate tracks should be provided upon lines of heavy traffic for trains which are run at high speed and do not stop at all stations;

all necessary measures should be taken to accelerate the movement of passengers and start the trains promptly. In this way the expenditure of energy required to regain time lost is conserved, and the promptness with which the service is conducted communicates itself to the passengers, who quickly learn to move more rapidly; the frequency of train movements should be proportioned to the volume of traffic, to avoid prolonged waiting of passengers and congestion at stations.

Alexander Wilson, assistant general manager of the North-Eastern Railway, England, stated that the North-Eastern Railway has been operating for the past year an electric suburban service in the Newcastle district, with the object of regaining the traffic from the competing tramways and to increase its amount. All the traffic has not been regained from the tramways, but the amount handled has been considerably increased. The reduction in expenses has resulted in a net revenue which more than covers the interest on the extra cost of installation necessitated by the introduction of the electric power. The current is being furnished at a reasonable price by power stations which do not belong to the railroad.

A. Mange, secretary to the management of the Paris-Orleans Railroad, stated that the Paris-Orleans road operates electrically 12.4 miles (20 km) on the Paris-Juvisy line. 100 trains daily instead of seventy-five as before the use of electric power. Four tracks are used, two for express trains and two for locals. The trains operated are reversible. There are two types of trains: heavy trains, 286 tons (260 tonnes) and 1000 seats; and light trains, 73 tons (66 tonnes) and 650 seats. The labor of one man was saved, the motor men alone fulfilling the duties of the fireman and engineer on the steam road.

Mr. Brisse, assistant chief of operation of the Compagnie de l'Est (France), explained why the majority of the French railroad companies are still in a waiting state as to the electrification of their lines. He stated that the operation of express and local trains on the same line does not necessarily reduce the capacity of this line, compared with lines where local trains only are operated.

Mr. Sullivan stated that installations have been made at the terminal station at Boston, underground, for a continuous circular service. Reversible motor trains like those of the Paris-Orleans road reduce considerably the time required at the terminal between the arrival and the departure of the trains. But the arrangement of the tracks in loops insures a still closer continuity and avoids the inconveniences due to switching from one track to another.

The discussion finally turned to the various types of cars best suited to a rapid service. Mr. Jenny, superintendent of the Southern road of Austria, said that experiments conducted on Vienna suburban traffic showed that cars provided with doors at both ends for the incoming and outgoing passengers give better results than side-door cars. The end-door cars were emptied and filled in thirty to forty seconds.

Mr. Sullivan, on the contrary, spoke strongly in favor of the side-door car. A train made up of Illinois Central cars, of which he is the designer, and carrying 1000 passengers, can discharge its load in ten seconds. Trains of this character can be despatched on the same track at intervals of fifty seconds apart. These cars in summer are completely open and accessible to the public at all points at once. In the winter a mechanical arrangement has been adopted enabling the conductor to open by one movement twelve doors, or a fraction thereof. In addition the closing motion sets up an electric current which notifies the motorman at the head of the train and permits the immediate starting of the train, with the assurance that all passengers are safely on board. These cars have aisles extending through the train so that passengers can hunt for seats after boarding the train.

At the conclusion of its proceedings on May 8, Section III. adopted the following conclusions:

The section approves the conclusion of the reporter as to the working of suburban traffic. It has listened with interest to the description given of the use of electric traction in England and France, but it is not in a position to express its preference for one or the other method of traction, steam or electricity.

On May 5 Section V. considered the effect of light railways on main lines following the presentation of a paper on this subject prepared by C. de Burlet, of the Belgium National Light Railways. The discussion was almost entirely upon conditions in Europe, and the resolutions adopted as a result of the deliberation were in their favor. They were as follows:

It may be said in general that light railways, when they are really tributary to main lines, are unquestionably useful auxiliaries to the latter, consequently the friendly co-operation of the main lines and concessions by the latter of desirable facilities are fully justified; and it is to be desired that all railway management should be inspired by the same liberal ideas held on the subject in Austro-Hungary and adopt as broad and simple conditions as possible to facilitate junctions and the operation of interchange of traffic with light railways.

It was decided by Section II. to discuss the subject of electric traction concurrently with Section V. on Thursday, May 11. In this connection the president announced the receipt of a telegram from Charles Ferraris, Minister of Public Works of Italy, regretting that the inauguration of the new régime in the State railway of Italy prevented the attendance of the officials at the Congress. He stated, however, that while these commissioners planned to transmit to the Permanent Commission at Brussels a detailed report on the application of electric power to the steam railroad system of Italy, it might be of interest to acquaint the delegates while in session that the recently completed electrical equipment of the Valtellina Railway has proved very satisfactory.

It was also announced that through the courtesy of the Census Department copies of the late exhaustive report by that department on electric railways could be secured through written application by the delegates.

A report of the subsequent meetings of the sections, from May 9-13, so far as they relate to the field covered by this paper, will be published in the issue of next week.

The social events on May 5-6 included an afternoon reception to the delegates at the White House by Vice-President Fairbanks and visits to the Capitol and National Library. On Monday there was a reception to the foreign delegates by the German Embassy, and on Tuesday a visit was paid to the new Union Station, followed by a banquet in the evening at the New Willard Hotel.

AN OLD LANDMARK EXPLOITED FOR TRAFFIC PURPOSES BY THE LOS ANGELES INTERURBAN RAILWAY COMPANY

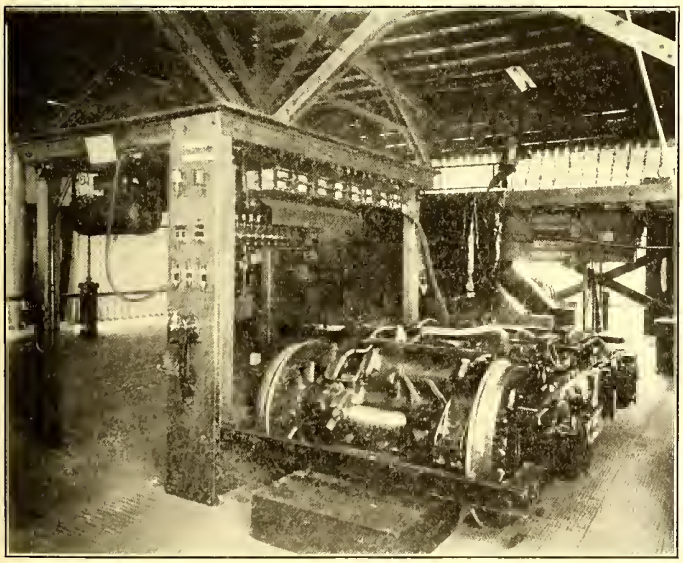
One of the oldest homesteads in all the Southland has been acquired by the Los Angeles Interurban Railway, of Los Angeles, Cal., and made a unique attraction of its Glendale scenic line. It is the old Verdugo ranch house that has stood for more than a hundred years and is one of the historical landmarks of Southern California. The land upon which it stands was granted by the Mexican Government in 1784 to Jose Maria Verdugo, with the understanding that he must follow the general rule for such grants, "that every ranchero should build on his grant a substantial house and keep at least 2000 head of cattle."

Abandoned for decades and all but fallen into complete ruin, the old adobe house has been restored by the railway company to its former condition of rude strength and comfort, and is now a terminal resort that has proved very popular with winter tourists for its genuine old-time Spanish dinners, as prepared under the direction of Senora Piedad Yorba. The credit of rehabilitating this old landmark belongs to Joseph McMillan, traffic manager of the Huntington interurban railway companies.

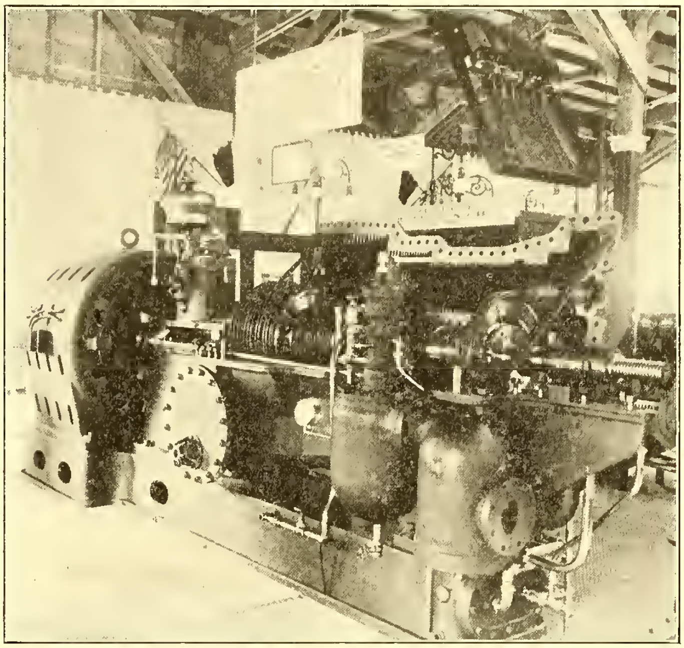
THE EXHIBITS AT WASHINGTON

An extended account of the principal exhibits of interest to electric railway companies, made at the Railway Congress at Washington, was printed in the last issue of this paper, so that no attempt will be made to publish here a general review of the exhibition. Several views are presented, however, of the large exhibit of the Westinghouse Electric & Manufacturing Company, and two engravings are shown of the General Electric booth during the day and at night. There were a number of new appliances and apparatus exhibited at Washington, and it is also the intention to publish descriptions and illustrations of them. Several appear in this issue and others will follow.

It was a very significant fact that the two most prominent exhibits at this steam railroad convention were those of the General Electric Company and of the Westinghouse companies. The latter was the largest of any at the convention, and was devoted to all of the different industries with which Mr. Westinghouse is prominently identified. At the right of the main entrance was the exhibit of the Westinghouse Air Brake Company, whose brake and coupler display included many operative exhibits. Thus, the Westinghouse automatic air and steam coupler was demonstrated by an arrangement of two short car platforms modeled to represent the ends of passenger and freight cars, together with a locomotive pilot, one car platform being so mounted as to permit a variation of 4 ins. in its height and a propulsion at a considerable momentum toward either the pilot on one end or the other car platform on the other. Provision was also made for the illustration of successful hose coupling at extreme curves. The model was operated with compressed air and the hose lines were supplied with both air and steam pressure. A miniature model of two complete car trucks and frames fitted with air and steam and signal hose coupling and air cylinders supplemented the heavy exhibit, and both were in more or less constant operation. The Westinghouse magnetic brake was also shown in operation by an arrangement of a moving truck; the Westinghouse friction draft gear was displayed on a testing rack on which it was compressed with an air force of approximately 150,000 lbs., a slow and serial release without recoil demonstrating a feature of prime importance in its operation; and the locomotive driver brakes and the automatic slack adjusters of the American Brake Company, racks hung with valves of various forms shown in sections, and several types of motor-driven and steam air compressors completed the display. The operation of Westinghouse air brakes was completely illustrated in the "instruction car" of the Brake Company on the special track at B and Fourteenth Streets, in charge of the company's regular instruction corps.

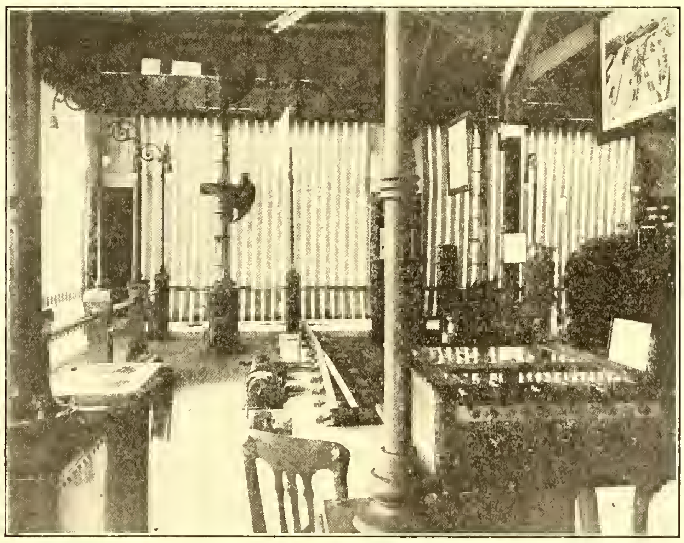


BALDWIN TRUCK EQUIPPED WITH WESTINGHOUSE D. C. MOTOR AND MULTIPLE-UNIT CONTROL AS USED ON LONG ISLAND RAILROAD



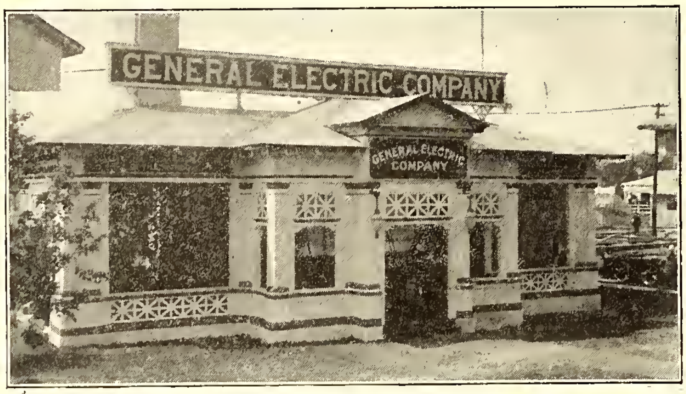
600-HP WESTINGHOUSE-PARSONS STEAM TURBINE OPEN FOR INSPECTION

To the left of the entrance was the exhibit of the Union Switch & Signal Company, where were shown the electric, pneumatic and staff signals of the company, switches, semaphores, etc. In this space also was shown, set up and open for inspection, a 600-hp Westinghouse-Parsons steam turbine, which attracted wide attention; a blue printing frame with Cooper Hewitt lamps, and other apparatus. At the right of the south entrance was a space devoted to heavy machine tools, suitable to steam railroad repair shops. A detailed description and illustrations of two of the more interesting of these tools appear elsewhere.



THE EXHIBIT OF THE UNION SWITCH & SIGNAL COMPANY, SHOWING ELECTRICALLY-OPERATED TRACK SWITCH, STAFF SYSTEM, SEMAPHORES, ETC.

At the rear of the exhibit was a 50-ft. dummy car platform completely equipped with single-phase motors and "straight-air" brakes, and with the Westinghouse unit system of multiple control as designed for alternating-current practice, with induction regulators, by means of which a variable operating voltage is secured to provide a wide range of speed without resistance losses. The motors were of type No. 106, 100-hp capacity, two on each truck, and the master controller and brake operating valve was mounted at each end of the platform as in the motorman's cab, the entire car frame being so raised above elevated tracks as to permit the revolution of the wheels under slight frictional pressure on greased rails to keep the motors under load. The tracks were raised several feet above the floor to permit thorough inspection of the underhanging parts, and a side platform reached by a stairway afforded a close view of the motor mounts. The entire equipment is similar to that of the Westinghouse single-phase cars built for the Vallejo, Benicia & Napa Valley road in California, the Blairsville and Derry line near Pittsburg, and other alternating-current suburban systems not requiring combination rheostatic control for direct-current service over tracks within city limits previously equipped. The straight alternating-current system was exhibited as more desirable than the combination equipment. Alternating current for the operation of the motors was obtained from a 400-kw rotary converter, running inverted, which received direct current at 500 volts from outside the exhibition grounds. The latest form of Westinghouse multiple control for direct-current practice was also demonstrated in a complete car equipment for the operation of a truck driven by two No. 113 motors, each of 200-hp capacity, a type embodying slight modifications of motor No. 86 for heavy train service on the Long Island Railroad. The unit-switch group, which was fully described in the last issue of this paper, was open for inspection. The exhibit was lighted by Cooper Hewitt and Nernst lamps.



THE GENERAL ELECTRIC COMPANY EXHIBIT BOOTH

THE GENERAL ELECTRIC EXHIBIT

The General Electric Company made no attempt to exhibit a very large variety of its products and appliances. Instead a handsome booth was erected just to the right of the main entrance and contained a few of the latest appliances of the company. Of these, one which attracted the greatest interest was the new automatic block-signal system of the company. Signal engineers will be interested in the announcement that the company has acquired all the patents, rights and special tools of R. Herman, covering his automatic, electrically-operated block signals and other devices relating thereto. This signal will hereafter be known as the General Electric signal. An important feature of this signal is that the operating mechanism, which is electric, is placed in a mechanical case at the top of the pole or mast, where it is easy of inspection and provided with protection in all kinds of weather. The company is prepared to supply bottom post mechanism, however, of the same design, when desired. The connections of a three-position automatic block signal for double-track lines is illustrated herewith. As yet the company has developed the system for use with the usual track blocks for steam lines only.

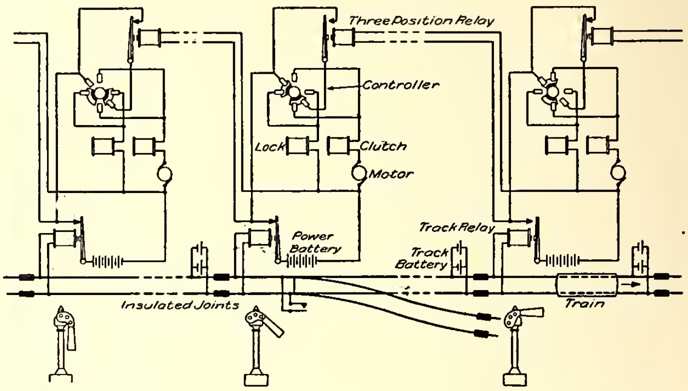
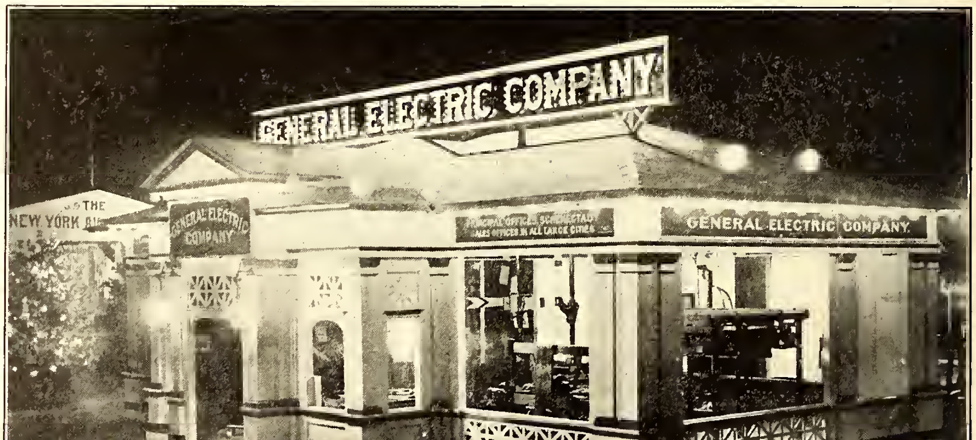


DIAGRAM OF CONNECTIONS OF GENERAL ELECTRIC BLOCK SIGNAL SYSTEM

It is stated, however, that the company's engineers are at work upon such modifications of the system as will adapt it to electric railway service.

In addition to its signal system, the company exhibited the latest form of Sprague-General Electric multiple-unit control, such as used in Boston; a small Curtis turbine directly connected to a direct-current generator; moving pictures of the works at Schenectady and of the new New York Central locomotives; magnetite lamps, mercury arc rectifiers, etc. The company also had adjoining its space a short track on which a mining locomotive was run. This locomotive was equipped with a reel on which the double conductor for receiving the current is received. Previously, the company has used a single conductor with a rail return, but with this locomotive the complete metallic circuit was employed.



A NIGHT VIEW OF THE GENERAL ELECTRIC COMPANY'S EXHIBIT BOOTH

West End, on Lake Pontchartrain, the popular summer resort which has recently been re-leased by the New Orleans Railways Company, will be formally opened on May 14. The attractions promise to be of unusual interest and merit this season, as the Railways Company has arranged with Manager Bray, of the Orpheum Circuit, to furnish vaudeville attractions, and with the Orpheum orchestra to furnish music.

MEETING OF THE OHIO INTERURBAN RAILWAY ASSOCIATION

The April meeting of the Ohio Interurban Railway Association was held at Springfield, April 27. The principal topic for discussion at the morning session was "Summer Resorts; Special Attractions and How to Handle Summer Business." The question of whether it was advisable for roads to own and operate parks brought out a wide diversity of opinions. Some managers thought the parks ought to be owned and operated by outside parties, others favored owning the parks and leasing them, while others believed best results were obtainable by the railways not only owning but operating such resorts. All agreed that they were great traffic inducers. On the point of handling crowds, it was the general opinion that more money could be made if park traffic could be gaged so that it could be handled in regular cars. Where extra service was necessary it was deemed more advisable to use trailers or run double-headers during times of heavy traffic than to run special cars or numerous extras. On the subject of excursion rates it was brought out by several managers that it was foolish to reduce rates, especially where extra cars were required to handle the traffic, as it was shown that extra cars cost more to operate than regulars, and that frequently rates were unwittingly brought down below actual cost of operation. The opinion was expressed that the interurbans could not profitably compete with steam roads on Sunday excursion business where large crowds were handled on special trains.

A. L. Neareamer, of the Columbus, Delaware & Marion Railway, said that it was not necessary to equip parks with what are known as modern attractions to draw crowds. He thought that a place selected for its natural beauty and fitted up as a picnic ground with a few amusements, was better for an interurban road park than resorts modeled after the Coney Island plan. Baseball games, band concerts and fireworks on holidays served as good attractions at comparatively small expense. Judicious advertising and personal solicitation were necessary to make a resort a success. They organize picnics for churches, secret organizations and societies, and pay particular attention to family reunions. He thought that one of the chief essentials was to give good service. Watch the crowds and have plenty of cars to take them home. Nothing detracts from an outing so much as having to stand on the return trip. His company operates two parks and they draw business from all points on their system.

Harrie P. Clegg, of the Dayton & Troy Electric Railway, said that for two years his company had operated Midway Park between Tippecanoe and Troy. They fitted up a theater and engaged a stock company for regular performances. They were not satisfied with their experiences and decided to lease the park this year. They found that the operation of the park distracted their attention from the more essential business of operating the road. The theater drew large crowds, but the people all wanted to go at once and return at once. It was necessary to operate special cars, upon which they lost money on account of long layovers for the men, besides interrupting the regular schedules. They did not have cars enough to take care of much of this extra business and did not think it warranted buying additional cars. They have decided to cater more particularly to the picnic business and will aim to handle it on regular cars, running double-headers where necessary.

C. N. Wilcoxon, formerly with the Western Ohio Railway, said that this company paid considerable attention to park business. Its resort, McBeth Park, was located near Lima, which was undesirable from one standpoint—that it was near the terminus of the system. The resort is owned and operated jointly by the Lima City Company and the Western Ohio. Two years ago they spent about $20,000 in improvements, including the erection of a theater and dance hall. The location is about 4 miles from Lima, and during the season the city cars operate on half-hourly headway, with fifteen-minute service evenings. The interurban cars operate on hourly headway. Park tickets are sold at 15 cents for the round trip, including admission to the park. Where no tickets are bought the fare is 10 cents each way and 10 cents admission to the park. The two companies divide on the park ticket business and tickets are good on either kind of cars. From points on the Western Ohio lines round-trip tickets are sold at half the regular rate, including admission to the park. These rates do not apply on holidays, as the company prefers to haul the people into Lima, giving them a longer haul. Few special cars are operated by the interurban company, and it is the aim to handle the business on regular cars. Nearly all the park privileges are let out by the season. The resort has usually been self-sustaining and the increased business to the road has been a great help.

J. R. Harrigan, of the Columbus, Buckeye Lake & Newark Traction Company, said that he operated Buckeye Lake Park, near Hebron, and Idlewild Park, near Newark. Formerly these parks were operated by outside parties, but for two years the company conducted affairs, and Mr. Harrigan believes this is the only satisfactory plan. He has a manager who devotes his entire time to the operation and advertising of the two resorts. Buckeye Lake is the largest body of water in Central Ohio. The company spent about $35,000 in improvements to its terminus and park. It is building a fifty-room hotel and has a theater and other attractions. The resort is on a spur line and a 60-ft. excursion car meets cars on the main line in both directions. In summer there is half-hourly headway between Columbus and Newark and the lake. On July 4 last year they handled nearly 1200 people between Columbus and the lake at 80 cents each, no reduced rates being made except to parties of over thirty persons. The company has laid out a large tract on the banks of the lake and sites are leased to cottagers. This gives considerable commuter business and helps the freight business. Last year the park showed a small profit. Idlewild Park, near Newark, is also self-sustaining. This year the company will try free admission to the grounds. Vaudeville performances are given during the season and scheduled baseball games are played.

F. W. Coen, of the Lake Shore Electric, said that his company was blessed with fifteen parks and picnic grounds, nearly all of them on the lake shore between Sandusky and Cleveland. Two are owned by the company and both are leased, as the company does not believe in operating parks. Avon Park, owned by the company, has been equipped with a pavilion and dance hall, which is heated and lighted from the power station 600 ft. distant. The company makes special rates from Cleveland to this resort on account of competition of other parks, but these are the only special rates except in the case of parties of thirty or more. Cedar Point, near Sandusky, gives the company an immense amount of business, last year about 12,000 tickets being sold from points along its line. It also handles considerable excursion business in connection with one of the steam roads. The company has a passenger solicitor who devotes his entire time to arranging excursion picnics and outings. On the east end of the road the company operates half-hourly headway during the summer months, in addition to which there are five limiteds each way, so that there is practically a twenty-minute headway between Ceylon Junction and Cleveland, so that special cars are operated only on occasions of unusually heavy traffic, and then they are handled as second sections of regular cars.

F. J. J. Sloat, of the Cincinnati, Dayton & Toledo Traction Company, said he did not favor interurban railway companies operating parks. Near Hamilton they have a park where open-air performances are given and it is well patronized by Hamilton people, the business being taken care of by the city cars. They have found it advantageous to handle the crowds with trail cars, hauling five or six in a train at times, light summer cars being used for this purpose. For eighteen days during the summer they have a Chautauqua meeting near Franklin, and have handled as high as 30,000 people on a single day. Two years ago they ran numerous special cars for this event, but found that it demoralized their regular schedules, losing as high as three and a half hours from regular schedules on a single day. Last year they increased their regular schedules, giving thirty-minute headway between Cincinnati and Dayton, fifteen-minute headway between Hamilton and Dayton and additional cars between Franklin and Dayton. By watching the traffic and placing trailers on cars at heavy periods, the business was handled without interfering with regular traffic.

Mr. Sloat thought that many roads were ambitious to handle excursion traffic, and did so to the detriment of their regular service and to their net earnings. He recalled an incident when he was connected with another road in the early days of interurban lines. In competition with the steam roads, the company took a contract to handle an excursion of 1500 people to connect with a boat line. The road had sixteen cars and it took every one of them to handle the people. The regular service was practically disrupted and, owing to the low rate, the road lost considerable by the transaction. Owing to long layovers, strain on power stations and interruption to regular traffic, it costs considerably more per car-mile to operate special cars than cars in regular service. On the basis of passengers handled last year, he figured that it cost something over 7-10 cent per passenger-mile for actual operating expenses. Assuming that it costs in excess of this for special cars, he thought it foolhardy for roads to attempt to handle this class of business for 1 cent per mile, or less, as some of them are doing. His company has a sliding scale for parties from ten to one hundred or more, the minimum being 1.4 cents for single-trip and 1.3 cents for round-trip rate; and when it is necessary to go below these rates he preferred that the steam roads handle the business. On the ton-mile basis of calculation, the electrics cannot hope to compete with steam roads at the present stage of the game. His company handles people with single cars, or perhaps one trailer, and each car requires two men. The steam road takes an old locomotive, hitches to it a string of antiquated cars, fit for nothing else, and can haul a thousand with greater ease than the electric can haul 200. Some of the rates the steam roads are making are astonishing. They will take a person from Cleveland to Columbus and return, 340 miles, for $1.50, about 0.4 cent per mile. Between Cincinnati and Hamilton, the Cincinnati, Hamilton & Dayton (steam) formerly ran fifty-two trains per day. Now they have only twenty trains a day, and they are handling commuters at ½ cent a mile and less. They can have all they want of it; we want 1 3-10 cents for that class of business.

Mr. Neareamer said his road was paralleled by three steam roads and they make a rate of 1 cent per mile between all competing stations on Sundays. On week days they sell "twin tickets" good on the trains of any of the three roads, giving rates less than the electric. The interurban has not deviated from its rates and does not go after the Sunday excursion business.

George S. Davis, of the STREET RAILWAY JOURNAL, described the method of the Stark Electric Railway for handling excursion business. As outlined in a recent issue of this paper, this road bought a number of old elevated trail cars at a very low cost, and operates excursion trains of five or six cars. It discourages the use of its regular cars by the crowds which attend baseball games and other attractions at its park.

During the afternoon session E. C. Meade, of the Westinghouse Company, was to have addressed the meeting on the subject of the single-phase system, but it was announced that the evening previous Mr. Meade had been taken seriously ill at Dayton and had to be operated on for appendicitis. He is reported to be recovering. W. I. Slichter, of the General Electric Company, agreed to give a short talk on this subject and spoke extemporaneously. He reviewed the early history of the a. c. motor and described B. J. Arnold's work with the single-phase induction motor on the Lansing & St. Johns Railway. He also described the polyphase motor as used in Europe, stating that its principal faults were heavy starting and heating losses and a tendency to climb grades at a maximum power consumption. The single-phase motor as developed by American engineers has the varying speed characteristics of the d. c. motor. The adoption of the single-phase system showed a saving of 40 per cent to 60 per cent in cost of copper and rotaries, and a saving of 20 per cent to 30 per cent on whole investment. The motors, operated through transformers with several voltages and without rheostats, gave a saving of 10 per cent to 25 per cent in power in acceleration. The great difficulty at present is in arranging for city terminals and in passing through towns where 500-volt d. c. current was necessary, but this difficulty was being overcome. He described the methods of wiring and insulating the car, the methods of connecting for a. c. and d. c., and the interlocking switch mechanism for changing from a. c. to d. c. As an example of the abilty of a car of this type to climb grades and pull heavy loads, he said that on the Pontiac road a 30-ton car equipped with four 75-hp a. c. motors had been for a number of months used in construction work, hauling ballast cars aggregating 55 tons where it was frequently necessary to start on 1 per cent grades, and it easily kept up the schedules of the other cars. While the a. c. motors will not start with the same "spirit" as the d. c., yet this difficulty is not as great as commonly reported, as the acceleration may easily be made 1¼ m.p.h. per second. He believed that the system was most desirable for roads where few stops are necessary. There is no difficulty in handling the motors on d. c. current, and the compensating wiring seems to improve the power factor and the commutation.

G. H. Kelsey, electrical engineer of the Western Ohio, asked if the present three-phase power-house machinery was as satisfactory for the operation of single-phase motors as single-phase machinery would be. And he inquired if it would unbalance the load to operate part of a system with the a. c. scheme and part of the d. c.

Mr. Slichter said that the Indianapolis & Cincinnati Traction Company had three-phase machinery in the power house, transformed the current to two-phase and divided the line into two sections, and said that the scheme of splitting the circuit was practical even if the load was not perfectly balanced. He thought there would be no difficulty in operating three-phase or d. c. circuits from the same machinery, as close regulation was not necessary on railway work, but he thought there might be difficulties where there were lighting circuits.

Mr. Gillette, master mechanic of the Columbus, Delaware & Marion, asked if the present d. c. motors could be adapted for a. c. by the addition of the compensating winding.

Mr. Slichter thought it might be possible, but impractical, as the proportioning of the parts on the a. c. motor was different.

Mr. Gillette asked what would happen if a car ran over from the 500-volt d. c. wire to the 3000-volt a. c. trolley wire without operating the switching mechanism.

Mr. Slichter said the motors were tested to 3000 volts in the factory, but were not expected to stand that current for any length of time. He said there would be no difficulties if it was not repeated too often. On the Ballston line, cars equipped with d. c. motors have frequently got connected with the a. c. trolley, and it simply opened the circuit breakers in the station.

Mr. Sloat, of the Cincinnati, Dayton & Toledo, asked if, on a line 10 miles long and fifty stops, and allowing ten to fifteen seconds per stop, the a. c. motors would operate as successfully and make the time as well as the d. c.

Mr. Slichter thought that up to about four stops per mile the

a. c. motors would give better and more economical service, but in the case suggested, it would probably be necessary to install heavier motors. He said the line of demarcation where the a. c. would be more economical was difficult to draw, and that the length of line, territory, number of stops, grades, saving in copper and other things must be taken into consideration in each case.

Mr. Sloat said that the single-phase system had been considered in the reconstruction plans for the Cincinnati, Dayton & Toledo. On 37 miles they have 168 stops, and on 18 miles, 68 stops, and there are towns every mile or two where it would be necessary to change from a. c. to d. c. He asked if the loss in time for numerous changes and the increased size of motors necessary to provide for such frequent acceleration would not make the a. c. system more expensive.

Mr. Slichter declined to commit himself without considering other features, but he said the loss of time in changing from a. c. to d. c. and back amounted to very little; on some of their roads it can be made while the car is in motion.

When asked if it was necessary to have sub-station attendants, he said this matter was still being discussed pro and con. But he said that usually sub-stations could be placed so that they would come in towns where there were ticket agents. About the only attention which was required was that of replacing automatics.

He was asked if the carrying capacity of the track bonds could be reduced in proportion to the carrying capacity of the feeders; for example, with a line employing 500 volts and four 0000 feeders, including trolley, and using four 0000 bonds on the return circuit, would it be sufficient to use one 0000 bond on one rail if the line used 2000 volts with one 0000 trolley? He replied that he thought the return might be cut to about the same carrying capacity as the feeder, but that the rails had an inductive drop, which had no relation to the bonding.

President E. C. Spring stated that he had recently made a trip through Michigan and Northern Ohio, endeavoring to interest other roads in the association, and particularly in the scheme of interchangeable transportation. He said that he had met with a pleasing reception wherever he went, and thought four or five additional roads would soon join the agreement. He asked that the various managers make it a point to send each other all possible literature, time-tables, rate sheets, etc., so that agents on various roads could be informed as to possible routes and connections.

The Pierce Publishing Company, of Lima, Ohio, announced that it was preparing to publish a guide and maps of electric railroads in Ohio, Michigan, Indiana and Illinois, and the executive committee voted to recommend the plan to the members.

The transportation committee reported that it had been unable to make arrangements with the Indiana Street Railway Association in the matter of an interchangeable transportation good in both States, due to the low rates on the majority of Indiana roads, but it was stated that the Indiana roads had decided not to get out a book of their own for the present, and as many of them as possible will join in the Ohio agreement. Two roads are now using the Ohio book. The committee reported twenty-one roads in the agreement, the latest being the Grand Rapids, Grand Haven & Muskegon Railway, of Michigan.

During the afternoon, through the courtesy of General Manager Green, of the Springfield, Troy & Piqua Traction Company, the members visited the power station, car shops and park of that company.

The Augusta Railway & Electric Company Benefit Association, of Augusta, Ga., has re-elected officers as follows for the ensuing year: R. E. Hunt, president; C. L. Furbay, vice-president; A. J. McKnight, treasurer, and C. E. Moring, secretary. The quarters of the association are to be improved materially.

CORRESPONDENCE

THE SYSTEM OF FARE COLLECTION AND TICKETS EMPLOYED ON THE LINES OF THE ROCHESTER & EASTERN RAILWAY COMPANY

Canandaigua, N. Y., May 1, 1905.

Editors Street Railway Journal:

The paper, "Tickets, Their Use and Abuse," by Mr. Norviel, printed in the Journal of April 22, 1905, and your editorial comments are very interesting to the writer, as the system of collection of fares on the Rochester & Eastern Rapid Railway was designed after steam road practice and is decidedly successful in its operation. The line at present is 44 miles from Rochester to Geneva, and all ticket fares are based on mileage at the rate of 1.5 cents per mile for one-way tickets, with a reduction for round trip. Mileage books are sold in three denominations: 100 miles at 1.5 cents per mile, 500 miles at 1.3 cents per mile and 1000 miles at 1.2 cents per mile. School forty-six-trip and regular fifty-four-trip monthly coupon books are based on a mileage rate 5 per cent lower than the rate of the direct competing steam road. Excursion coupon tickets over connecting lines and steamboats are issued at regular rates for regular business, and at slightly reduced rates for special events. All tickets and mileage books, except special excursion tickets and commutation tickets, are good in the hands of any person until used. Cash fares are based on 2 cents per mile, which is the steam road rate, duplex is issued and no redemption made. Conductors sell no tickets except 100-mile books.

Sub-stations are erected with ticket office, waiting room and express room, and at only two points is it necessary to have stations and agents in addition to employees necessary to operate if ticket system were not in effect, and operating expenses are not increased 1 per cent thereby.

The fare-zone system has proven inadequate and unsatisfactory on an interurban line of any length, and the mileage basis is the most convenient, equitable and satisfactory to the public as well as to the company. The labor of fare collecting and accounting is much simplified instead of increased, and loss from non-collection of fares on account of crowds is reduced to a minimum. On many of our trains it would be a physical impossibility for a conductor to collect cash fares from passengers and attend to his other duties.

If a cash-fare system is followed, based on mileage, some form of a fare receipt must be issued, and any such fare receipt will cost at least 50 per cent more than a ticket. The higher rate for cash fares, with no redemption of fare receipts, teaches the traveling public very rapidly to purchase tickets, with the result that our cash fares are only about 14 per cent of the total.

There appear to be only two apparently valid objections to a complete ticket system: First, injustice to patrons taking trains at flag stops; second, increased expenses of maintaining a few ticket offices.

Sale by the conductors of 100-mile books and no limitation on regular tickets obviate the first objection, for we find that such patrons provide themselves with a mileage book or with a supply of tickets, and within a few months all complaints stop. As to the second objection, it must be admitted that operating expenses are increased, but from an advertising standpoint such additional expenses are a good investment. The public is better informed and better served, and increased patronage much more than balances the increased expenses.

We have studied results of our ticket system very carefully and we would not abandon it under any consideration.

J. H. Pardee, General Manager.

THE QUESTION BOX

Among the topics discussed this week in the master mechanic's department are methods of cleaning and washing cars, and methods of testing armatures and fields without removing the motors from the car. Two questions pertaining to the engine room are answered, and a suggestion for expediting the work of stringing trolley wire is given.

E.—THE MASTER MECHANIC'S DEPARTMENT

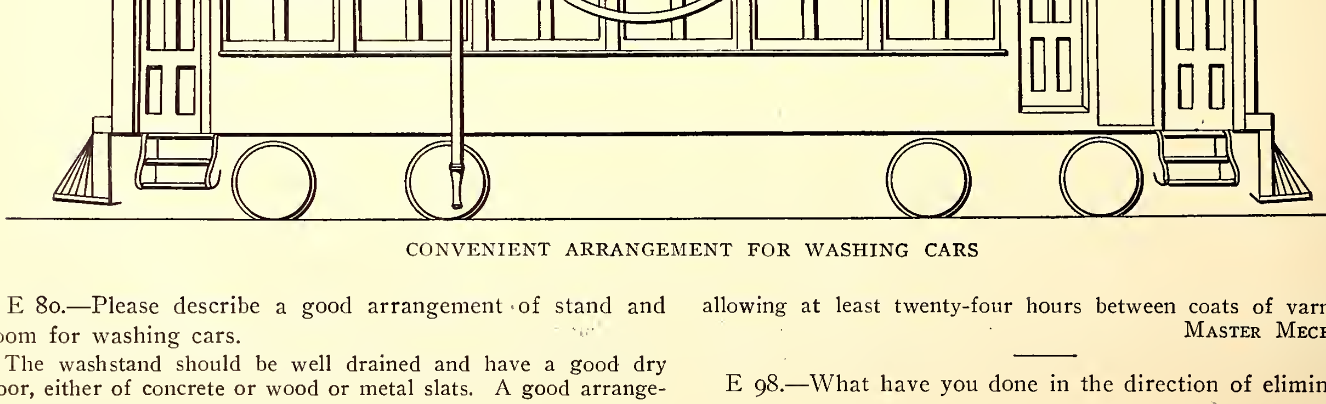
E 79.—Should the matter of cleaning and washing cars come under the transportation department or the master mechanic's department? What are the advantages and disadvantages of either system?

The writer was interested in reading the answers to questions on washing cars given in your Question Box Department for Feb. 28, page 368. The washing of cars should come under the jurisdiction of the master mechanic, and should certainly be turned over by him to the personal attention of the master car painter. Especially should this be done if the painting on the cars to be washed was done under the master painter's supervision, for the reason that he is the man who should know how the painting was done, and consequently should be in a position to understand best how to wash the cars. The master painter is the man who is quickly brought to book should the general appearance of the cars be unsatisfactory as regards the painting. Therefore, it seems to the writer a simple matter of justice to give the painter entire control of the matter of car washing. It is very easy to lay the foundation of ruin to the whole painting if this work is left in the hands of careless and irresponsible car washers. To illustrate this point, the following incident might be related. Not long ago the writer was engaged in painting by contract a large number of winter cars for a road in Brooklyn. The first cars run out of the paint shop were wanted immediately for service, and the writer suggested to the depot master the advisability of washing the cars to harden the varnish, and the work was turned over to the regular car washers. Two hours later, happening to be passing the place where the washers were working, I discovered they were using a heavy solution of soap, and even allowing this to become dry in places on the new varnish. It is true that clean cold water applied to a newly painted car will harden the varnish, but soap will destroy any freshly varnished surface. This was a case of ignorance, and could not have happened if the washing had been in charge of a practical painter. The master painter should be given an opportunity of inspecting cars regularly, and he is the man to select such cars from time to time as in his judgment appear most in need of thorough washing, and he should decide the best way to wash cars.

John C. Weaver, Bound Brook, N. J.

Cleaning and washing should come under master mechanic's department on account of cleaning newly varnished cars, etc.

Francis G. Daniell, New York City.



CONVENIENT ARRANGEMENT FOR WASHING CARS

E 80.—Please describe a good arrangement of stand and room for washing cars.

The washstand should be well drained and have a good dry floor, either of concrete or wood or metal slats. A good arrangement for supplying water is shown in the illustration. The water valve should be conveniently located and the hose should be long enough to reach any part of the car. The hose is supported on an overhead traveler, made by attaching half of an iron pipe, bent into a curve, to an ordinary form of sliding-door hanger which runs upon an overhead I-beam. It is preferable to have a separate I-beam runway for each side of the car. With this arrangement it is virtually impossible to kink the hose. The valve on the water supply can be arranged to be opened and closed with a rod from the floor.

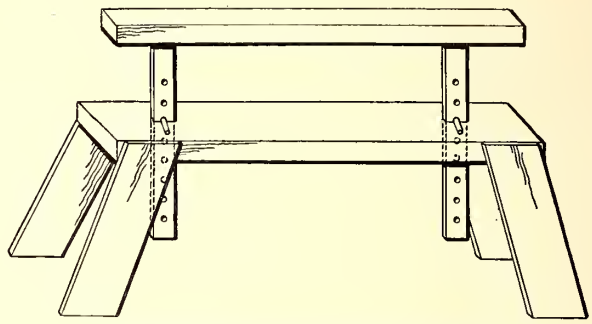
Francis G. Daniell, New York City.

E 85.—What are good ways of heating the paint room?

A satisfactory way of heating a paint shop is to put the heater coils between the track, under the cars. Master Mechanic.

E 87.—What is a good form of scaffolding for use when painting cars?

A good form of adjustable horse is shown in the sketch, and


ADJUSTABLE HORSE FOR PAINT ROOMS

needs no further explanation. Two of these horses with a plank between make a very good staging for painting cars.

Francis G. Daniell, New York City.

E 91.—Please describe in detail your method of painting cars from start to finish.

A moderately short and satisfactory method of painting cars is given herewith. Cars painted by this method have stood for three years with comparatively no change in the paint, though they have been varnished over each year. One priming coat of lead mixed with two-thirds oil and one-third turpentine; after 48 hours putty, and when dry, sand paper; apply second coat of primer with very little oil; after not less than 12 hours put on rough stuff, using four coats of rough stuff, allowing not less than eight hours between each coat; put on guide coat, and after a day rub down with pumice stone; next apply two coats of color, allowing a day between each coat; stripe and letter; then put on one coat of rubbing varnish, rub down and put on two coats of finishing varnish, allowing at least twenty-four hours between coats of varnish.

Master Mechanic.

E 98.—What have you done in the direction of eliminating beading, superfluous decoration and fancy work from your cars?

Ornamental designs have been reduced to a corner piece in each of the four corners of the outside convex panel, and of the head linings with a broad line and parallel fine line along edges of outside panels and the head linings. The broad line is aluminum except in the lower concave panel outside where it is painted.

Master Mechanic.

E 100.—The suggestion is made that the regular daily inspection of cars should be made at the terminals of the lines, between regular trips. Is this feasible, and what are the advantages to be gained?

Where cars have from eight to twelve minutes layover at the terminals at dinner hour, it is found practical to inspect the cars and adjust the brakes at this time. Master Mechanic.

E 101.—Please describe in detail your system for inspecting cars.

Cars are run over pit each day, when brakes are adjusted, any bolts tightened, sand boxes examined, and any repairs made that are noted on motorman's report blank of defects.

J. Chas. Ross, Gen. Mgr.,
Steubenville (Ohio) Tract. & Lt. Co.

In addition to the daily inspection, cars are thoroughly gone over every four or six days, at which time shoes are renewed. About every six weeks the oil wells are taken down and cleaned out, and the journal bearings oiled. When armature bearings are renewed, say every three to five months, the entire motor is cleaned up and inspected. Master Mechanic.

E 102.—What is your system for inspecting trolley bases, poles, harps and wheels?

Trolleys are oiled and inspected during the layover at the terminals. Master Mechanic.

E 103.—Please state in detail the extent and exact nature of the nightly inspection of cars as practiced on your road.

We do no inspecting at night.

J. Chas. Ross, Gen. Mgr.,
Steubenville (Ohio) Tract. & Lt. Co.

The nightly inspection is confined to the care of commutators and brushes, and oiling armature and motor bearings. Master Mechanic.

E 111.—When doing repair work on double-truck cars, which method is preferable—lifting the bodies from trucks and doing the work from the top, or doing the work from the pit? Please state what you consider the advantages and disadvantages of each method.

Experience shows that work done from above is more thoroughly and comfortably done, but work done from the pit can be done more quickly, and avoids the troubles incident to cutting electrical connections to the motors. In a general way it might be said that work from above is preferable for large motors, while work from the pit is better for small motors.

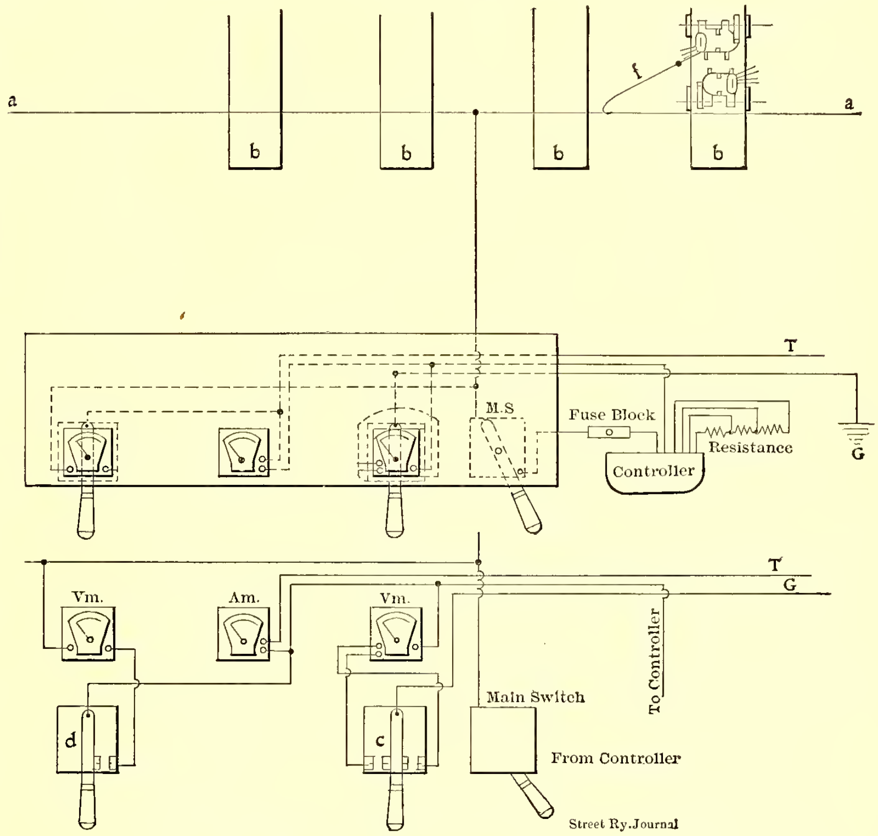
Master Mechanic.

E 113.—As a general proposition, is it cheaper for a road to make its own armature and field coils than it is to buy them?

As a general proposition it is cheaper for a road to make its own coils than to buy them, providing there are not more than one or two kinds of coils used on the road, and providing there are enough of them to keep a low-priced employee busy continuously on coils. Master Mechanic.

E 126.—What is a good way of testing armatures and fields without removing the motors from the car during regular inspections, particularly on small and medium size roads?

The arrangement at the shops of the Louisville Railway Company for testing out motors, controllers, car wiring, etc., is indicated in the drawing herewith. The letter "b" represents the pit tracks, and "a" represents a copper wire stretching across the pits at a height of 16 ft. above the floor. A tap from this wire leads to an elevated platform or gallery, where the testing instruments and switches are located. The gallery is so situated that the man stationed at the instruments can overlook all the pits. In order to test field coils for resistances, the truck is run out from under the car body, and by means of a wooden pole having a hook on one end made of No. 6 rubber-covered wire, and a sleeve with thumb screw on the other end, connection is made between the cross wire "a" and the field leads. The method of procedure will be understood by consulting the diagram. One lead wire is left grounded, and by closing the main switch, bringing the controller handle in the elevated gallery to the second or third notch, and moving the switch handle "c" underneath the voltmeter, to the right, the circuit is completed from trolley through ammeter and through voltmeter "c". This voltmeter has a double scale, and when the switch handle "c" is thrown to right, the millivolt scale is thrown in circuit. It will be evident that by taking the reading of the millivolt scale and the ammeter simultaneously, the resistance of the field coil can be accurately determined. As for example, if the milli-



MOTOR TESTING ARRANGEMENT, LOUISVILLE SHOPS

volt reading is 35, and the ammeter reading is 10, the resistance of the field coil will be $\frac{V\ 35}{C\ 10} = 3.5$ ohms.

To locate leakage in the fields, detach the ground wire from the truck, and, using the voltmeter "d" by throwing the switch "d" to the right, faults can be detected by touching the lower end of the fish-pole connection to the field lead wires, the commutator, brush holder, etc. This arrangement is also used for testing controllers and car wiring. For testing wiring, disconnect the motor leads, except the ground wire, leaving the car body on the truck. Then with the hook of the fish pole over the cross wire, touch the other end of the pole connection to the armature, field and resistance wires leading from the controller board, then controller and reversing switch. Any faults will at once be indicated by the voltmeter. The fish-pole connection is also used for moving trucks back and forth over the pit tracks. To accomplish this, connect up one motor with the fish-pole connection, and the man in the gallery then closes the main switch and brings the gallery controller to the first or second point, so that the truck is moved by its own motors. In the same manner we run each motor before it goes under the car, as a final test; this is done by jacking up the truck on each side high enough for the wheels to clear the rail. The arrangement is also used for testing-out rheostats and resistance coils.

JOHN ZOLL, MASTER MECHANIC,
Louisville (Ky.) Ry. Co.

E 129.—Have you found any scheme for securing better contact between motor commutators and carbon brushes?

Under no circumstances use sand paper on the commutators. When the car is in for overhauling, or before armature is taken out of lathe, polish the commutator by using a strip of canvas and a very small amount of machine oil. The use of sand paper means a rough surface; a rough surface means the wearing away of the carbons, and the wearing away of the carbons is responsible for a great amount of dust in the modern motor. Dust in the motors leads to numerous troubles, not the least of which are flat spots on commutators.

J. L. SULLIVAN, St. Louis, Mo.

G.—THE ENGINE ROOM

G 3.—Is it possible to run a commercial lighting or power load from generating units that are supplying current for railway purposes? How can it be done? What is the best method of regulation in such case to prevent fluctuations in the lighting or power circuit?

It is possible and very practicable to run commercial lighting loads from the same generating units that are supplying current for railway purposes. We have six water power stations and one steam station all operating in parallel, giving a general supply for incandescent and arc lighting, power for various purposes, such as smelters, mines, cement works, brick works, mills, factories, etc., also for the entire electric railway system of Salt Lake City. The entire generating system is run at 60 cycles. The supply for the railway is transformed by means of rotary converters and synchronous motor generators. In our case particularly, a great advantage is gained by running all power stations in parallel, thus giving a "momentum" to the system which no considerable amount of load variation on the railway system can affect. Two important points are necessary, that of speed regulation and voltage regulation, the former being in fact the most important in the operation of a large system. There need not be any sudden fluctuation in the speed or voltage with proper governors, and particularly with careful watching on the part of the operators. The power factor meter properly watched in each station gives each operator a method of studying the voltage regulation, cross-current between stations, etc. Transmission lines need not be overloaded with idle current, or anything but effective kilowatt power. To care for any voltage variations, 3-phase voltage regulators, say of the indicated revolution type, motors actuated automatically by a compensator regulator, will draw a perfectly steady voltage line on the lighting load.

O. A. HONNOLD, Opr. Engr.,
Utah Light & Ry. Co., Salt Lake City.

It is possible to run commercial lighting from power-generating machinery. Feeders must be run independently from the switchboard. Fluctations in voltage can be taken care of by means of a Tirril automatic voltage regulator. If frequency is not suitable a motor-generating set must be installed with a voltage regulator on the generator.

The Cleveland & Southwestern Tract. Co.

We operate a power load from a 500-kw generator direct connected to a Corliss engine. We have a specially built fly-wheel on this engine to which is belted a 200-kw generator to operate our cars. Without any regulating device our voltage on the power-circuit lines is maintained from 545 volts to 550 volts.

L. M. LEVINSON, Mgr. Shreveport (La.) Tract. Co.

It probably can be done in some cases, but it is not good practice, and the writer would suggest that the railway and lighting loads be kept on separate generators.

H. A. TIEMANN, New York City.

G 8.—A young engineer, who has yet to win his spurs, has been given charge of the power house on a 20-car road. He has been asked by the manager to carry out a general efficiency test of the entire station. He wants suggestions from some of the older heads as to some of the things he should and should not do in carrying out these tests. He wants to know how to dispose his available forces so as to obtain the data without taking on additional help. If your manager should ask you to make tests and report on just what each department of the power house was doing and could do, how would you go about it to get the information? This is a matter especially worthy of discussion. Suggestions are particularly requested.

Would base more on weekly or monthly average results than from special efficiency tests covering a day's run. Each member of the operating staff should be given to understand definitely his part of the responsibility for the total economy of operation. Careful records should be kept of kw-hours measured, not by amperes times volts, but by recording kw-hour meters; pounds of coal burned per day; oil and waste used; miscellaneous supplies and labor item, all being figured per kw-hour. The results should be kept in tabulated form and in such shape that comparisons can be made from week to week or from month to month. Comparative curves kept up from the tabulated data, will show clearly the results obtained, whether decreasing or increasing, and the per cent. In this way all of the station operators can be interested in working for results and will be aided in keeping down costs per kw-hour for fuel, oil, waste, etc.

O. A. HONNOLD, Opr. Engr.,
Utah Light & Ry. Co., Salt Lake City.

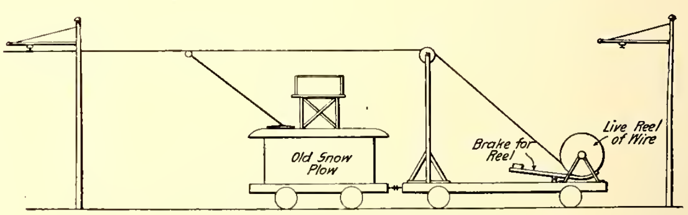
Test depends upon circumstances and facilities at hand. If there is a water meter in the boiler-feed circuit and a wattmeter on the switchboard output, he can get fairly good results with his regular force of help. He can weigh his coal supply on small scales as it is being passed to the firemen. If he has no water meter he might be able to rent one. Water meter should be calibrated after use. If he uses measuring tanks he will require an extra man to run them. He can put a thermometer in boiler-feed pipe to get boiler-feed temperature. He should take readings of water consumed, power given out and temperature of boiler-feed every two hours. Run test ten or twenty-four hours and note weight of coal and ashes. Start with fires clean and water level near middle of gage glass, and close with same conditions. He can with above data calculate efficiency of boilers, and from load output and water input approximate efficiency in the engine room sufficient for commercial purposes.

The Cleveland & Southwestern Tract. Co.

H.—THE LINE DEPARTMENT

H 21.—What means, machines, devices, special rigged cars, etc., do you know of for expediting or cheapening the work of stringing trolley wire?

The work of stringing trolley wires can be cheapened and simplified by using some such rigging as shown herewith. The reel of trolley wire is placed on a flat-car resting on A supports, which are grounded. The flat-car containing the reel is pushed by some



SUGGESTION FOR STRINGING WIRE

form of tower-car equipped with motors. The trolley wire is strung out alive, the wire passing from the reel up over a standard on the flat-car, as shown. The method of procedure is of course simple. The motor car takes current from the live wire which it is stringing. The car is pushed to a trolley pole, and the upright standard on the flat-car brings the wire to the proper level for fastening to the pole brackets. The men on the tower car then make the necessary connections and the outfit proceeds to the next pole. Some form of brake is required to govern the movements of the reel of wire, and a brake that will fill all needs can be made of a plank pivoted so that one end, which is provided with leather facings, will bear against the under side of the reel, while the other end is weighted with scrap iron.

EDITORS.

SIGNALS FOR INDICATING CONTROLLER POSITIONS

It would frequently be of considerable assistance to a motorman in the performance of his duties if, when following another car, he had some means of telling whether the motorman on the car ahead was applying or shutting off power, or whether he was running with controller on series or multiple position. This knowledge would enable the operator of the second car to govern his own actions to better advantage, tending to give better economy in car operation, less liability to rear end collisions, better spacing of cars and, in general, relieving motormen of considerable mental strain. A system of rear and front signal lamps on each car, in connection with the controller contacts, has been devised by William Lintern, of West Park, Ohio, to accomplish just these results. The arrangement is of particular advantage on congested city lines, and also on high-speed lines, as it provides means whereby the position of the controller on any car can be determined from a distance by means of the signal lamps on the car. An incidental advantage of this is obtained in that inspectors or superintendents in the street are enabled to check up the proper or improper handling of controllers by individual motormen, and the rules regarding the too rapid application of power, and the use of power on grades and at approaches to dangerous points, such as crossings, swing bridges, etc., can be enforced more effectually.

On double-track lines the signals are also of value in preventing accidents to passengers who may be alighting from cars, as the motormen are always able to tell from a distance whether a car coming in the opposite direction has stopped or is about to stop.

In Fig. 1 is shown a diagrammatic plan of connections on a car equipped with the Lintern signal system. In the diagram, a indicates trolley or line contact; b is positive wire of armature No. 1; c is negative wire of armature No. 1, and positive wire of field No. 1; d, when controller is on series position, indicates negative wire of field No. 1, and positive wire of armature No. 2, and on multiple positions, d is positive wire of armature No. 2, and has direct connection with a; e is positive wire of field No. 2; g is negative wire of field No. 2 and ground wire; h is lamp connection to controllers.

Assuming that controller is at off position, there are approximately 500 volts at a. The circuit through red lamps from a is completed through the green lamps and (by means of a

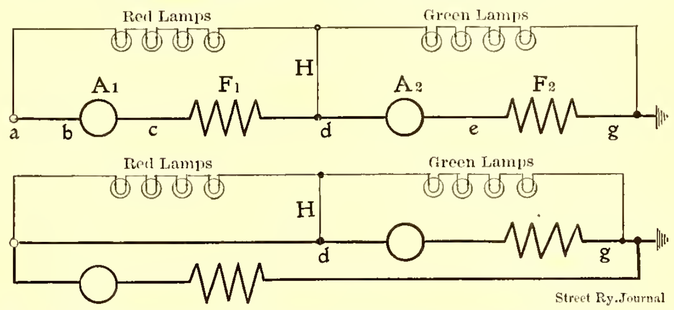


FIG. 1.—DIAGRAMMATIC PLAN OF CONNECTIONS FOR SIGNAL SYSTEM

simple contact switch actuated by the controller handle) through motor No. 2, but as the resistance of the green lamps is relatively very high as compared with the motor circuit, a short-circuit is made through motor No. 2. The result is red lamps receive full power and burn brightly. The green lamps are now out. When power is applied, the difference of potential between a and d decreases until the last series position is reached, when approximately a difference equal to one-half the line voltage exists between a and d and d and g, and both circuits of lamps will burn at about one-half the candle-power capacity. This clearly indicates starting.

When multiple positions are reached, a and d are at the same potential. Then h being connected to d, no difference of potential exists between the terminals of the red lamp circuit, and the red lamps are out. But as the potential at d is approximately 500 volts, the green lamp circuit is at full candle-power. This indicates car is moving at full speed.

Fig. 2 shows the connections as applied to the K-type of controllers for a double-end car. It will be understood that connections for single-end cars are much simplified. It will also be noted that the connections are applied to the contact plate of reversing switch, thus making the system automatic in adjusting itself for use from either end of the car.

The system is also applicable to controllers used with multiple-unit control.

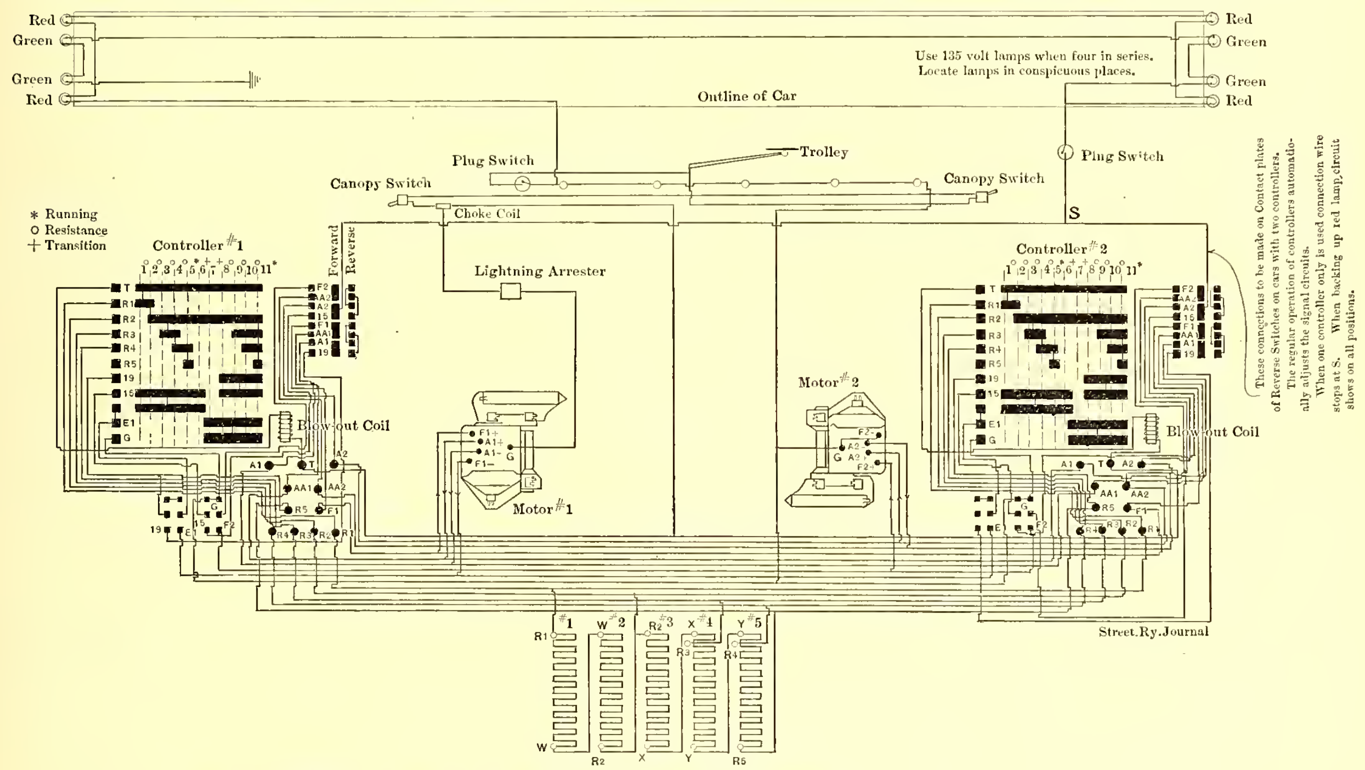
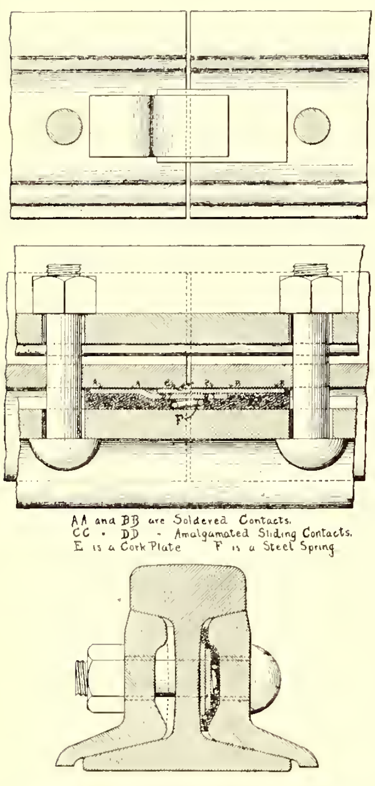


FIG. 2.—CONNECTIONS FOR SIGNAL SYSTEMS, AS APPLIED TO K-TYPE OF CONTROLLERS

A QUICKLY-APPLIED SOLDERED RAIL-BOND

Harold P. Brown, of New York, has just placed on the market the self-soldering rail-bond which is illustrated in the accompanying engraving, and which was publicly shown for the first time at the International Railway Congress in Washington.

This bond is composed of two copper strips with a section of 1½ ins. x ⅛ in. or more, and 3 ins. or more long. The surfaces are protected from corrosion by a heavy coating of non-rusting alloy. One of these copper strips is soldered to the web of one of the rails at its end, so that one-third of its length laps onto the web of the second rail. On the latter rail the second bonding strip is firmly soldered, and it is provided with an off-set, so that it laps over the first strip and carries current across the joint, leaving opportunity for ½ in. of end play without breaking contact. The rubbing surfaces are provided with an adhering layer of plastic alloy of high conductivity, which prevents rust and serves as a conductor and as a lubricant of the moving parts. The bond is then covered with a wide strip of packing, which excludes dust and dirt from the contact surfaces and holds in position a heavy steel spring bearing upon the angle plate and keeping the bonding strips in firm contact with each other. The feature of the bonds is the method of soldering. This is accomplished by the use of a heating material called "Calorium," which is ignited with a match. This material gives a double chemical reaction, the result of which is to bring the rail ends to a dull red temperature of about 1000 degs. to 1100 degs. F. This melts the solder on the bond terminals and unites them permanently to the steel. Calorium can, of course, be used with any type of soldered bond, and Mr. Brown will supply it for that purpose. The method of applying it to the bond already described is first to prepare the contact surface of the rail with a hand-power grinder, covering the bond with a special flux and solder and clamping it into position on the rail. The clamp that holds the bond also holds the cast-iron crucible against the web of the rail. The crucible is held against the rail on the side opposite to that on which the bonds are to be soldered. Mr. Brown has tried various materials, such as fire clay, etc., for protecting the inside of this small crucible, but has found that ordinary paper answers as well as anything else.



RAIL SECTIONS AND ELEVATION, SHOWING SOLDERED BOND IN PLACE

To solder the bond to the rail the briquettes of calorium are dropped into the crucible and ignited and the rail is heated up to the requiste temperature in about ten seconds. The calorium does not give any residuum of metallic alloy, but a slag which does not adhere to the rail or decarbonize it, and can easily be broken off. Mr. Brown has also applied the same material to soldering his well-known plug bonds. This is accomplished by dipping the plug in solder and inserting it into the hole, and then placing some of the material on top and igniting it. The advantages claimed over the ordinary soldered bond are that the method insures a hot rail, which is necessary to a good soldering job, the rapidity of the process, and the fact that there is no deposit on the soldered surface as the result of heating.

The cross section of the knife blade bond, illustrated in the diagram, is two and one-half times that of a 0000 wire, and if any increase in resistance at the contact surface should occur after use, the initial conductivity can be almost instantly restored by rubbing the upper edge of the copper strips with a piece of Edison solid alloy and pouring on a little water.

The following is the result of a test of a steam railroad signal bond applied to a suspended rail-joint. The bond was applied through two ⅜-in. holes and through one angle plate only:

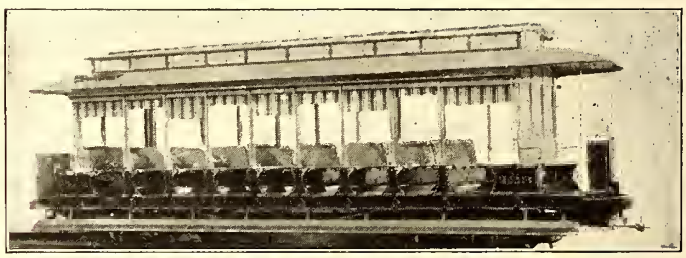
	Volts Drop	
Amperes	10" of Joint	10" of Rail
20	0.0007	0.00053
100	0.00372	0.00169
500	0.0173	0.00719
1000	0.0331	0.01402

After twenty-five minutes and under 1000 amps. there was no change in temperature noticeable to the touch, and the readings were:

1000	0.0335	0.01432

NARRAGANSETT CARS FOR PORT CHESTER, N. Y.

The Greenwich Tramways Company, of Port Chester, N. Y., recently received from the J. G. Brill Company five Narragansett cars which will be operated on lines traversing one of the finest suburban districts in the vicinity of New York and connect with trolley systems from other points in West Chester County. The town of Port Chester has a number of large manufacturing interests, and the Byram River, which is the boundary between New York and Connecticut, is navigable up to the town, which is about 2 miles from the coast of Long Island Sound. Several fine bathing beaches are reached by the lines, and the new cars will be much appreciated by the crowds which go to the beaches every fine day through the summer.



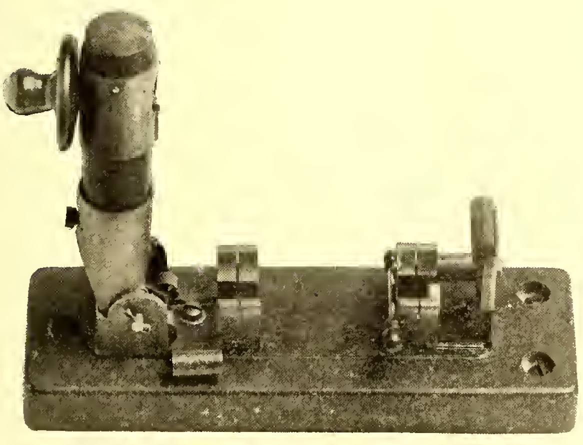
ONE OF THE NEW OPEN CARS USED BY THE GREENWICH TRAMWAY COMPANY

The cars measure 34 ft. ⅜ in. over the crown pieces and 8 ft. 3 ins. over the posts at belt. The eight seats in the central part of the car have reversible backs and the four bulkhead seats have stationary backs. Spring roller curtains are furnished for the side openings. The seats and backs are of ash strips and the ceilings are of decorated birch. What is practically a double step, without the disadvantages of that form of construction, is provided by substituting Z-irons for the usual thick timber sills, the upper step being formed by the middle web which keeps it within the line of the posts and the width over all within the restricted limits. A great amount of vertical strength is produced by the manner of fastening the side posts. A peculiarly formed pocket is bolted to the side of the sill and holds the end of the post, while on top of this is placed the ordinary round-corner seat-end panel. A ½-in. bolt holds the post into the pocket, which is equivalent to a 7-in. tenon, while the fastening of the post into the round-end seat-panel box still further increases the stiffness and strength of the connection. This makes the Narragansett car the strongest and most rigid form of open car yet constructed.

The general dimensions of the cars are as follows: Length over the crown pieces, 34 ft. 3/8 in.; distance from center of the corner posts over the crown pieces, 4 ft.; width over sills, 7 ft. 5 ins., and over the posts at the belt, 8 ft. 3 ins.; sweep of the posts, 5 ins.; side sill size, 5 ins. x 3 ins. x 1/2 in., Z-bars; thickness of the corner posts, 3 5/8 ins.; thickness of the side posts, 2 3/4 ins. The cars are mounted on No. 27-G trucks, with a 4-ft. wheel base and 33-in. wheels. The furnishings include Brill radial draw-bars, "Dedenda" gongs, "Dumpit" sand boxes and ratchet brake handles.

A NEW A. C. AND D. C. CIRCUIT BREAKER

To meet the demand for a compact and inexpensive circuit breaker for both alternating and direct-current circuits the Westinghouse Electric & Manufacturing Company has produced the type-F breaker, which is made in 12 1/2-amp., 25-amp., 50-amp. and 75-amp. sizes for 250 volts direct and 440 volts alternating. They are made in the overload type only. Two views are shown. The tripping point is adjusted by turning the thumb screw shown in the illustration, the range being from 80 per cent to 180 per cent rated capacity. The small insulating knob at the right of the contacts controls a tripping device by raising which the breaker may be opened by hand. By installing a breaker for each wire of the circuit, two for two-wire and three for three-wire circuits, the switch may be



TWO VIEWS OF A. C. AND D. C. CIRCUIT BREAKER

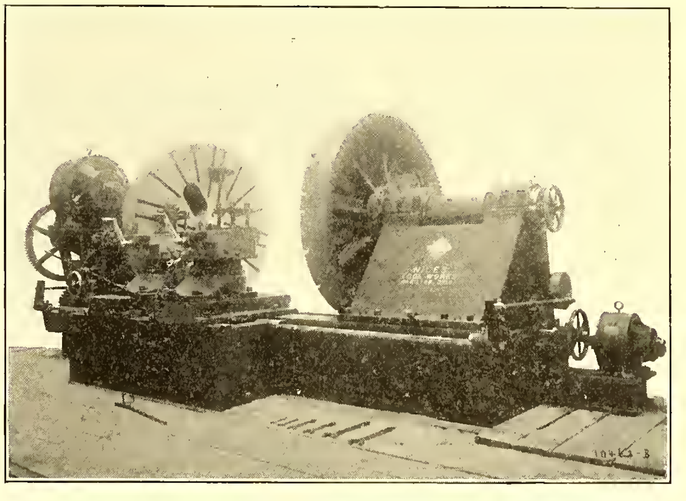
dispensed with and the circuits operated by means of the breakers alone. In this case the breakers are non-closable on overloads, the breaker on one side of the circuit opening when the breaker on the other side of the circuit is closed. An insulating knob is provided for closing. The only depth required in the containing box is that required for the opening of the breaker. Current carrying contacts are of copper, arcing contacts are carbon and are readily renewable. The lever arm is opened by a spring. The operating solenoid is inside of a fibre tube in the lever arm, which also conduces to a small and compact design. The parts of the breaker are mounted on a neat porcelain block, which is fastened to its support by three screws with countersunk heads.

Every effort has been made toward reducing the size and cost of this breaker, and the manufacturers expect to supply a great number of them because of the very small space required for installation, their low cost and their excellent operating characteristics.

AXLE AND DRIVING-WHEEL LATHE

The accompanying illustrations show two tools exhibited in the space of the Westinghouse Companies at Washington this week, which attracted wide attention, and which are excellent examples of the possibilities of the electric drive as applied to machine tools. The larger tool is a locomotive driving-wheel lathe of gigantic proportions, weighing over 100,000 lbs. and requiring a 40-hp motor to drive it. This is the 100-in. Niles driving-wheel lathe built by the Niles-Bement-Pond Company, New York. It will turn all sizes of wheels from 48 ins. to 90 ins. in diameter, and has an improved special type of mortised face plates for receiving the driving-wheel crank-pins, and thus permitting the wheels to be "chucked" close to them. The result of this improvement in chucking is that tires are held absolutely rigid under the heaviest cuts and chattering is entirely eliminated. The capacity of this machine is unusually large, six pairs of driving wheels turned per ten-hour day being a fair average, while if crowded this rate may be considerably increased. The great weight and strength of this tool and the high powered drive which it requires is an excellent example of the remarkable improvements that have of late been made in railway shop machinery, particularly as a result of the increasing use of the high-speed tool steels.

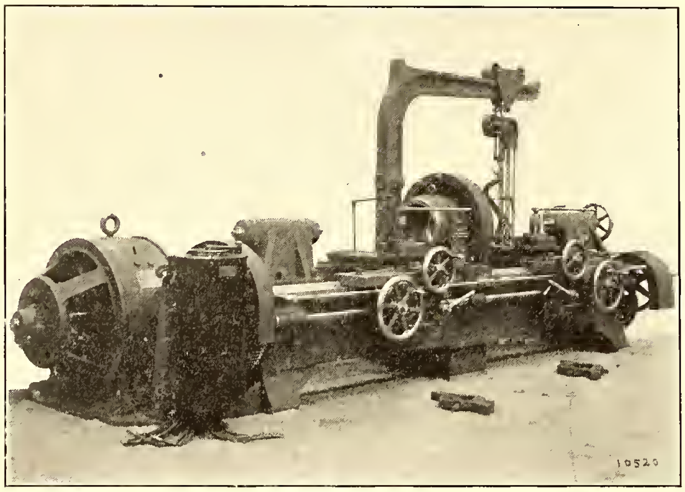
The motor used for driving the wheel lathe is a 40-hp type-S Westinghouse motor, arranged for variable-speed operation upon the field-control system, and is mounted upon the stationary headstock of the tool. It has a speed range of from 490 r. p. m. to 980 r. p. m., advancing through numerous incre-



LOCOMOTIVE DRIVING-WHEEL LATHE OPERATED BY 40-HP MOTOR AND AN AUXILIARY 5-HP MOTOR FOR TRAVERSING THE MOVABLE HEADSTOCK

ments by means of a hand controller conveniently located for the tool operator. The motor drives the machine through a gear mechanism which has changes providing a total range of cutting speeds at the wheel of from 10 ft to 25 ft. per minute. This permits tire truing to the best advantage upon all tires from 48 ins. to 90 ins. in diameter. This tool is also equipped with a 5-hp type-S motor, operating at constant speed for traversing the movable headstock for convenience in putting in pairs of wheels.

The second machine illustrated is the heavy Niles double-axle lathe of the center-drive type, which will take in axles and forgings up to 12½ ins. in diameter, and is designed to operate two cutting tools at heavy duty upon opposite ends for turning wheel seats and journals. This tool is driven by a 20-hp type-S Westinghouse variable-speed motor, so that heavy cutting service is provided for. The motor has a speed range of 340 r. p. m. to 1200 r. p. m., also operated by a hand controller. The motor is mounted upon an extension of the bed plate and drives the mechanism through gearing. Other tools on exhibit



DOUBLE-AXLE LATHE OF THE CENTER-DRIVE TYPE

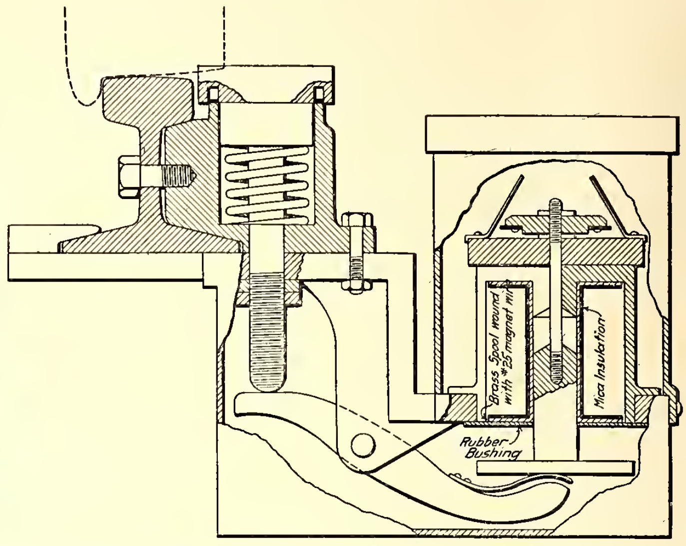
were a Putnam roughing lathe, driven by a 50-hp motor with a speed range of from 500 r. p. m. to 1000 r. p. m.; and a Sellers universal tool grinder, driven by a 7½-hp motor, mounted on a bed-plate extension and belt-connected to the driving shaft.

HIGHWAY CROSSING SIGNALS ON THE AURORA, ELGIN & CHICAGO RAILWAY

The Aurora, Elgin & Chicago Railway Company has a number of alarm bell highway crossing danger signals at street crossings in the suburban towns through which it passes. Two types of signal are in use. One of these is the Sedwick signal,

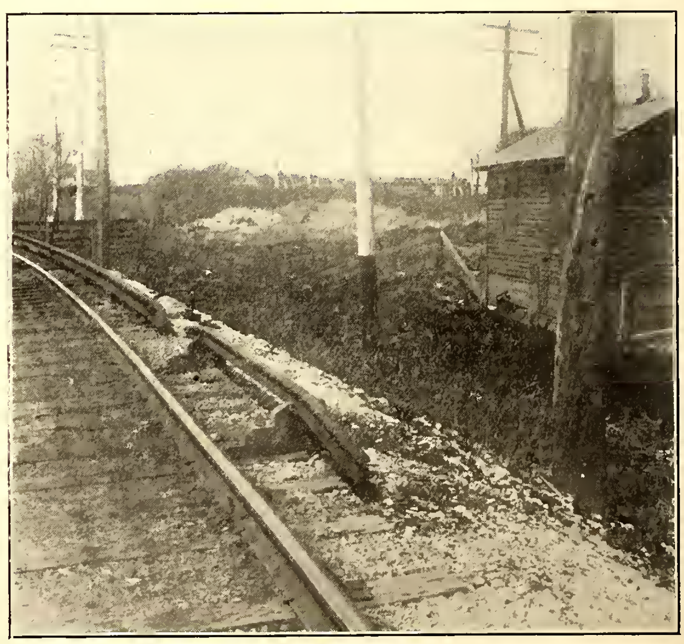
ALARM GONG ON POST AT CROSSING

which was perfected on this road and is soon to be manufactured by the Ohio Brass Company. The principle of this signal is very simple. A section of third rail is laid on the side of the track opposite to that of the regular third rail which supplies the current, as shown in the accompanying illustration. When a car passes this point, the contact shoes of the car, being all four in multiple, make contact between the regular third rail and the insulated section on the other side of the track. There is a circuit from the insulated section through a



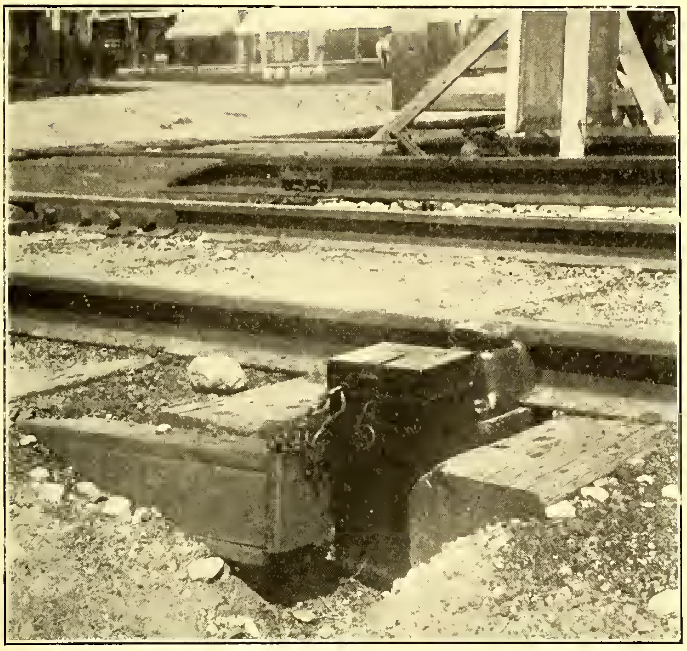
SECTIONAL VIEW, SHOWING HOW CAR WHEEL DEPRESSES PLUNGER, WHICH IN TURN CAUSES OPERATION OF A SOLENOID

relay and thence to ground. The relay has two sets of coils. When a car is approaching the crossing it passes over the section of rail which makes the contact so as to energize one pair of coils in the relay. The armature of the relay is then pulled over so as to make contact and establish a circuit from the regular third rail through a bank of five lamps to ground. An alarm bell is connected in shunt with one of these lamps. The lamps are lighted and the bell is rung until the car passes a second section of third rail which is beyond the crossing. In passing this section a circuit is established through the other pair of coils on the relay, which results in opening the alarm bell circuit and putting the signal out of operation until again energized by a car approaching the crossing.



AUXILIARY RAIL LAID FOR ALARM CIRCUIT

A more recent signal is that invented by Joseph Sauer and S. E. Johnson, both employees of the company. In this signal, the car wheels, in passing, depress the plunger of a track instrument, located close beside the rail, as indicated in the accompanying drawing and half-tone view. This plunger is held up by a powerful spring and can only be depressed by the car wheels. The car wheels, in depressing this plunger, operate a lever which pushes an armature up in a solenoid. This armature, when at the upper limit of its travel, makes contact between two fingers, thus completing the circuit from the trolley or third rail through the solenoid coil. The coil thus being energized, holds the plunger up of itself. The same circuit passes through the alarm bell and bank of lamps. The alarm bell circuit is broken by the passing of the car wheels over a similar track instrument on the other side of the crossing, which momentarily breaks the circuit and causes the solenoid of the track instrument on the other side of the crossing to let go. The same scheme can be used with battery current.



VIEW SHOWING LOCATION OF PLUNGER ALONGSIDE OF RAIL

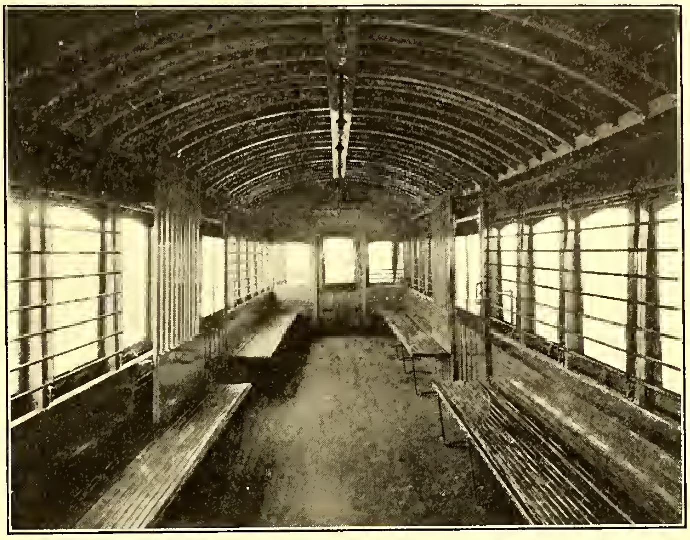
MAIL AND EXPRESS CAR FOR INDIAN TERRITORY

The mail and express car illustrated has lately been placed on the lines of the Indian Territory Traction Company. It was built by the American Car Company, and measures 45 ft. over the crown pieces and 8 ft. 4 ins. over the posts at the belt. Portable vestibules are at each end of car. The interior comprises one large room, along the sides of which are longitudinal seats arranged to fold. This arrangement is a very practical one, and the space and seats can be utilized in such a way as to meet almost any emergency. At the center of the car on either side are 40-in. sliding baggage doors, and single sliding doors are at each end.

MAIL AND EXPRESS CAR FOR THE INDIAN TERRITORY TRACTION COMPANY

The windows are arranged to drop into wall pockets, and as a protection from breakage by contact with baggage, longitudinal bars are placed on the inside. The car is lighted by incandescent lamps at intervals along the strip extending from end to end of car at center under the roof. The interior is finished in ash, natural, and the ceiling is of varnished carline finish.

The construction is unusually substantial and includes heavy letter-panel, and with the continuous arched rafters unbroken by a monitor deck, constitutes a very strong roof. The under trusses strengthen the center of the car for heavy loads, while inside trusses, centered over the body bolsters, also support the sills near the center and counteract any tendency to sag at the sill ends. Besides this, outside sill plates are used, forming altogether a very powerful construction entirely suitable to the carrying of heavy loads. The outer platform knees are reinforced with angle irons. M. C. B. couplers are at each end. Angle-iron bumpers, "Dedenda" gongs, folding gates, brake rigging and steps of Brill manufacture, and American Car Company's sand boxes are among the specialties. The car is mounted on the American Car Company's No. 23-A truck, with 6-ft. wheel base and 33-in. wheels. The length over the end panels is 37 ft., and from the panel over the crown piece, 4 ft. The width over the sills is 8 ft. 4 ins.; distance between the centers of posts, 29½ ins. The side sill size is 4½ ins. x 7¾ ins., and the end sill size, 5 ins. x 7¾ ins.; sill plates, ⅝ in. x 8 ins. The thickness of the corner posts is 3¾ ins., and of the side posts, 2¾ ins.; height of steps, 18⅛ ins., and of risers, 14½ ins.

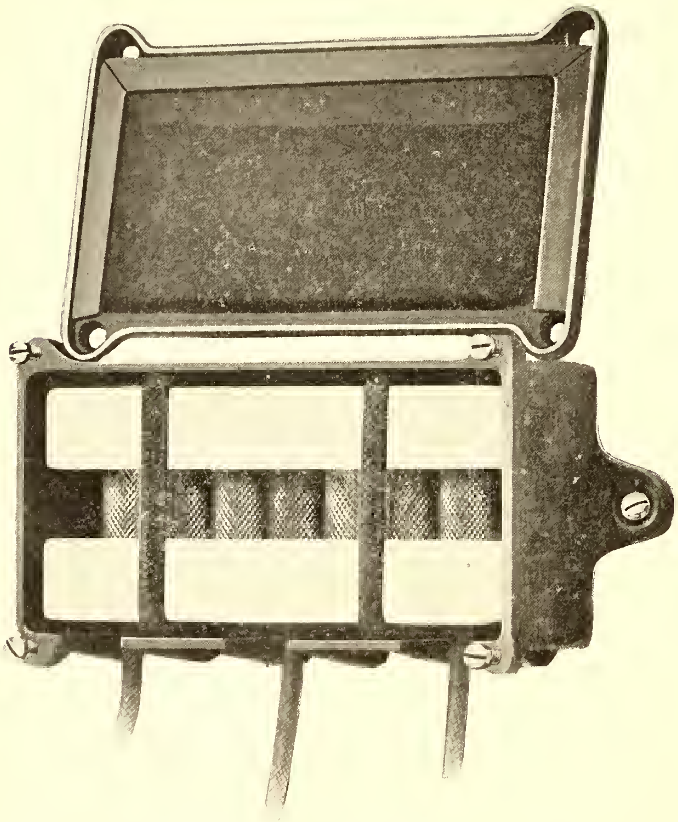


INTERIOR OF BAGGAGE CAR, SHOWING LONGITUDINAL FOLDING SEATS

AN IMPROVED LIGHTNING ARRESTER

The well-known Wurts non-arcing arrester, developed by the Westinghouse Electric & Manufacturing Company, has been in service now for over twelve years, and it is notable in this connection that the first changes in its mechanical mounting have only recently been found desirable. The old type of this arrester is used extensively, both here and abroad, for all conditions of service, ranging through power, lightning, telephone service on high-tension transmission systems and wherever protection was desired within its range. The new type has the same dimensions as the old type-C arrester, style No. 1383, and the arrester unit itself may be used as a repair part wherever this device has been employed. One improvement is the method of securing the non-arcing cylinders to the porcelain supports. These are firmly held in place by machine screws passing through holes in the porcelain supports and screwed in the line and ground contacts. Porcelain supports are molded to shape with the cylinder centers exactly spaced, thus securing a perfect air-gap adjustment. All the cylinders can be easily turned through any angle to present new surfaces for action. Line and ground leads are made in a very secure manner.

The assembled porcelain supports and cylinders are separated from the iron box by rubber-covered wire. This makes an effective packing, which insures the porcelain from breakage



LINE ARRESTER FOR OVERHEAD FEEDERS AND CIRCUITS

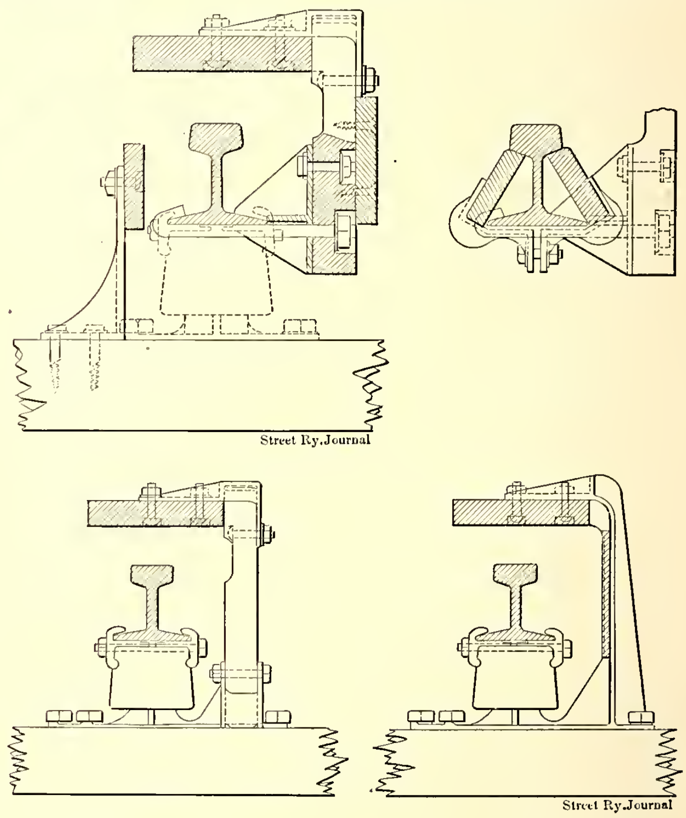
if the arrester be shaken or jarred, and the wire holds the packing in place. The cover is screwed to the box, rubber gaskets keeping out all rain. The arrester is of the line type, designed for connection to overhead feeders and circuits, the normal rating being from 500 volts to 1250 volts double pole and up to 2500 volts single pole. All the best electrical operating characteristics of the old type-C arrester are retained, the improvements consisting of improved mechanical construction, and consequently longer life and ease of inspection and repair.

THIRD-RAIL GUARD PATENTS

Patents have recently been issued to L. B. Stillwell and F. R. Slater, of the electrical department of the Interborough Company, New York, for the invention of the type of third-rail guard which is used in the New York Subway. The patents are two in number, one referring to the arrangement of protecting covering which is supported from the cross-tie, and the other that in which the covering plank is supported by a bracket clamped to the third rail itself, the latter being the type that was adopted for the subway conditions. The details of the guard as applied to the New York Subway were illustrated in the Oct. 8, 1904, issue of this journal, although it is to be noted that no side guards were used, as are indicated in the accompanying drawing, this having been considered unnecessary for the subway conditions.

In the case of supporting the guard from the third rail itself, wooden struts are clamped to one side of the rail at intervals by means of special iron castings fitting over the flange of the rail and held there by hook bolts; upon the top of the wooden struts further special iron brackets are bolted to support the overhanging longitudinal guard plank which is thus effective in keeping the rail free from obstructions. In the other case the guard plank is carried by means of an all metal or part wooden bracket construction which rests upon the cross-tie and forms a part of the rail insulator base, as illustrated in one of the accompanying engravings. In both cases the guard plank is thoroughly insulated from the rail so that it may be stepped on with safety by workmen in crossing the track, and in confined spaces, as in the tunnel, it serves as a very convenient walkway.

The method of supporting the guard plank from the rail itself has appeared to be the preferable arrangement, in that the clearance between rail and guard is always necessarily constant, and inequalities in level of the insulator support blocks can have no effect on the alignment of the plank; in the other case it is evident that a settling of the cross-tie and insulator away from the rail, as sometimes happens, would bring the plank down with it and endanger an obstruction to the collecting shoes upon the trains. This type of third-rail protection was first introduced upon the Wilkesbarre & Hazleton Railroad, which was opened for traffic in the spring of 1903, as was



DETAILS OF PROTECTED THIRD RAIL

noted in these columns; here the innovation operated very successfully through all classes of weather, including snow and sleet. It is also interesting to note that this improved form of protection, as applied in the subway, has been adopted and is being installed upon the suburban lines of the Long Island Railroad, which are now being equipped for electrical operation.

The Cleveland, Painesville & Ashtabula Railway has instituted a limited train service by which a fast car will leave Ashtabula at an early hour each morning and connect at Painesville with a limited on the Cleveland, Painesville & Eastern Railway. The 30 miles on the first-mentioned road will be made in one hour and two minutes, while the 60 miles to Cleveland will be made in two hours and twenty minutes.

FINANCIAL INTELLIGENCE

Wall Street, May 10, 1905.

The Money Market

There were no important changes in the money market this week. The tone was somewhat easier in consequence of the further accumulation of funds by the city institutions, but rates for both call and time loans have ruled practically unchanged from those recently quoted. Money on call was in abundant supply throughout the week, at rates ranging from 2½ to 3 per cent, with the bulk of the business transacted at 2¾ per cent. In the time loan department the volume of business was extremely small, owing in part to the continued liquidation in the stock market. Early in the week lenders reported a fairly good demand for three and four months money, which was satisfied at 3½ per cent. Six and seven month maturities were in moderate request at 3½ per cent, but the banks and trust companies were not inclined to press their funds at that figure. As a result, borrowers continued to draw their immediate wants from the call loan department, the belief being general on their part that lower rates for time money will be obtained in the near future. This belief is probably based upon the fact that the banks have materially strengthened their position during the past month, and all indications point to a continued movement of funds in this direction, which will more than offset the demands to be made upon the banks between now and the crop moving season. On May 15 the national banks will be required to pay over to the Government about $15,000,000, being about 25 per cent of the Government's deposits. Of this amount the local institutions will pay about $8,000,000 on their own account, and several millions more for the account of correspondents. The bank statement issued last Saturday made a decidedly favorable exhibit. Loans decreased $5,780,200, as a result of liquidation of stocks. Deposits decreased $2,630,700. There was a gain in cash of $1,406,500, which, together with a reduction in the reserve required of $657,675, resulted in a gain of $2,064,175 in the surplus reserve. The surplus is now $18,729,425, as against $22,724,200 in 1904, $10,029,825 in 1903, $3,461,000 in 1902, $8,127,475 in 1901, and $15,336,725 in 1900. The foreign markets have experienced no material change. The conditions remain easy at all the principal centers.

The Stock Market

Trading in the local securities market was upon a comparatively small scale this week, although prices displayed considerable irregularity; the general tone of the market was decidedly better. At the opening the market was inclined to recover from the depression which characterized the dealings in the previous week, but shortly afterwards the upward tendency was checked. London and the Continent were liberal sellers of stocks, which, together with heavy selling by local interests, carried prices off ½ to 4 per cent. During the last half of the week, however, the market developed increased strength, and apart from temporary reactions, the general tendency of prices was toward a higher level. A prominent feature of the week was the violent fluctuations in Consolidated Gas. In the early dealings pressure was brought to bear, and the price ran off 5½ points, but later, on the defeat of the 80-cent gas bill at Albany, it rallied 18¼ per cent. In the railway list Union Pacific showed early weakness, but subsequently the price was bid up sharply. Other strong issues were Northern Pacific, New York Central, Reading and St. Paul, and in the industrials, Rubber Goods Manufacturing, Amalgamated Copper, Colorado Fuel & Iron and Tennessee Coal were conspicuously firm features. The bond market was firm, prices generally reflecting an increased demand. The market closed steady. The local traction issues were quiet and heavy.

A quiet week on tractions in Cincinnati. Cincinnati, Dayton & Toledo stock was active, and advanced from 22½ to 23¾. The 5s of this company were active at 92 and 92½. Several large lots of Northern Ohio Traction consolidated 5s sold at 100⅛, Cincinnati, Newport & Covington common sold at 31¼. Detroit United lost 3¼ points to 82½.

At Cleveland, Aurora, Elgin & Chicago was most active, advancing to 17¾, and then declining to 15⅜ at the end of the week. Cleveland Electric was weak early in the week, but strengthened to 78½ on news of a favorable court decision. Northern Ohio Traction was stronger, and sold at 22¾ at the close. On Tuesday of this week Aurora, Elgin & Chicago strengthened, and several lots sold at 17, buyers thirty days. Aurora, Elgin & Chicago 5 per cent bonds have been active, and advanced from 89¾ to 90¾ in a few days. Muncie, Hartford & Fort Wayne sold at 49, and Northern Texas Traction at 57¾.

Philadelphia

Moderate activity, accompanied by sharp price fluctuations, characterized the trading in the local street railway issues this week. At the opening the market displayed a rallying tendency in sympathy with the improvement in the New York market, but in the later dealings renewed pressure was brought to bear on the speculative issues, which carried prices generally to a much lower level. Toward the close, however, a decidedly firmer tone developed, and prices for some issues ruled substantially above those prevailing at the close of the preceding week. United Gas & Improvement was by far the over-shadowing feature of the trading, both as regards activity and price movements. In the early trading there was a recovery of 1½ points to 113½, but the heavy selling, said to be for the account of certain politicians, dropped the price to 110, the lowest point attained in many weeks. The buying, however, was particularly good, and resulted in a sharp advance to 116¾, the final transaction being within ⅜ of the highest, a net gain for the week of 4⅛ points. Transactions aggregated 30,000 shares. Philadelphia Rapid Transit was under pressure, the price declining from 33¾ to 31⅞, from which it recovered only ⅛. About 10,000 shares were traded in. Philadelphia Traction held firm throughout, upwards of 1500 shares changing hands at 99⅞ to 99¾. Union Traction sold to the extent of about 1000 shares, at prices ranging from 60⅜ to 61, a net gain of ¼. United Companies of New Jersey advanced nearly a point to 271½, on the purchase of odd lots. Philadelphia Company common, on dealings amounting to 6500 shares, declined from 44¼ to 43½, and closed at the lowest. The preferred stock fluctuated between 48 and 48½, on light trading. Other transactions included American Railways at 52, Consolidated Traction of New Jersey at 84 to 83¾, Fairmount Park Transportation at 20 to 20½, Railways General at 3⅜, and United Traction of Pittsburg preferred at 51.

Chicago

The local traction stocks were practically neglected during the past week. Dealings included a very small number of issues, and transactions were confined almost entirely to odd lots. The sales reported included Chicago & Oak Park Elevated common at 6⅛ to 6, the preferred at 20¼ to 20, Metropolitan preferred at 61, West Chicago Street Railway at 45, Chicago Union Traction at 7¼, and South Side Elevated at 93.

Other Traction Securities

In the Baltimore market interest centered largely in United Railway issues, bonds which fluctuated sharply on rather heavy dealings. From 59½ at the opening the price ran off to 58¾, from which there was an advance to 61. In the final dealings rather free selling developed, which carried the price off to 60, a net gain of a point. About $95,000 were traded in. The 4 per cents were considerable less animated but steady, upwards of $44,000 changing hands at 92¼ to 92⅛. Several hundred shares of free stock at from 14⅛ to 15, while the certificates sold at 15. Other sales included $3,000 Norfolk Railway & Light 5s at 92¼, $2,000 Virginia Railway & Development 5s at 99, $4,000 Norfolk Street Railway 5s at 111½, $4,000 Lexington Street Railway 5s at 108½, and $9,000 Richmond Traction 5s at 106¾. The feature of the Boston market was the strength displayed by Boston Elevated, several hundred shares of which changed hands at from 156 to 158, a net advance of a point. Boston & Worcester stocks were quiet but firm, about 500 of the common selling at from 31 to 32½, a gain of ¼, while the preferred brought 80 and 79¾ for small amounts. Massachusetts Electric common declined 1¼ points in the early dealings to 17¼, but subsequently recovered to 18. The preferred broke from 65¾ to 64, and closed at 65, a loss of a point. West End common sold at 96½ to 96, and the preferred at 116½. In the New York curb market Interborough Rapid Transit continued its erratic movement on comparatively light dealings. Initial transactions were made at an advance of 2 points to 206, and on the exchange of 1100 shares the price yielded to 201, and closed at 202½. In all about 3500 shares were traded in. The company has sold during the week $10,000,000 4 per cent notes to a syndicate of bankers, the proceeds of which will be used to acquire new properties, additional equipment, improvements and various other requirements. The notes will mature on May 1, 1908. New Orleans Railway common ruled strong, 700 shares selling at prices ranging from 29 to 29½

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	May 3	May 10
American Railways	52	51½
Boston Elevated	156	156½
Brooklyn Rapid Transit	61½	60¼
Chicago City	—	—
Chicago Union Traction (common)	7¾	7
Chicago Union Traction (preferred)	35	—
Cleveland Electric	—	—
Consolidated Traction of New Jersey	83	82
Consolidated Traction of New Jersey 5s	110	109
Detroit United	82½	82⅝
Interborough Rapid Transit	202	202
International Traction of Buffalo	—	25
International Traction of Buffalo (preferred)	—	62
International Traction of Buffalo 4s	—	82
Manhattan Railway	163¾	164¾
Massachusetts Electric Cos. (common)	18	17
Massachusetts Electric Cos. (preferred)	65	64
Metropolitan Elevated, Chicago (common)	21	21
Metropolitan Elevated, Chicago (preferred)	60	60
Metropolitan Street	118¼	116
Metropolitan Securities	78½	77
New Orleans Railways (common), W. I	28⅞	29
New Orleans Railways (preferred), W. I	76	75
New Orleans Railways, 4½s	90½	90½
North American	101⅞	100⅝
North Jersey Street Railway	25	—
Philadelphia Company (common)	44¼	43¾
Philadelphia Rapid Transit	33½	32
Philadelphia Traction	—	99¾
Public Service Corporation 5 per cent notes	97½	97
Public Service Corporation certificates	71¼	70
South Side Elevated (Chicago)	93	a93
Third Avenue	126	125
Twin City, Minneapolis (common)	110¾	110¼
Union Traction (Philadelphia)	60¼	60½
West End (common)	a97	96
West End (preferred)	117	116½

a Asked. W. I., when issued.

Iron and Steel

The "Iron Age" says the returns of anthracite and coke pig iron show that during April, a short month, the output was 1,922,041 tons, an increase over March, when the product was 1,936,264 tons in thirty-one days. May promises to have an even higher record, since we entered the month with furnaces producing at the rate of 451,331 tons a week, compared with 439,564 tons on April 1. A study of the situation at the works proves that this will be the maximum for some time to come, since few new furnaces are due in the next few months, and since many producers are running at a rate which they cannot hope to maintain. Thus, the United States is operating 98 per cent of its theoretical capacity. The most significant feature of our furnace report is the fact that for the first time since last August the stock in hand of merchants shows an increase. The increase is small, only 17,000 tons, but it will be widely interpreted as an indication that the tide has turned. Southern makers of pig iron say the market has declined to the basis of 13.25 at Birmingham.

MIAMI & ERIE CANAL TO BE SCRAPPED

It is probable that the affairs of the Miami & Erie Canal Transportation Company will be wound up and the physical assets sold to satisfy the creditors. It is reported that the Cincinnati Trust Company, trustee for the bond mortgage, has given notice that it desires to proceed with the foreclosure suit, providing that there is no chance of reorganization, and W. Kesley Schoepf, who is at the head of the bondholders committee, is quoted as saying that he has been unable to satisfy all interests among the bondholders. He denies the report that he will purchase the tracks and other material for the Cincinnati, Dayton & Toledo line, which is to be rebuilt.

The Miami & Erie Canal Transportation Company had an interesting history. Five years ago T. N. Fordyce obtained a franchise from the State for hauling canal boats by "electric mules." He interested Cleveland capitalists, and the company was formed with a capital stock of $3,000,000, of which $2,000,000 was sold. It is generally understood, and not denied, that the promoters hoped to obtain additional concessions from the State to enable them to use the canal banks for electric or steam railroad purposes. This would have made the franchise very valuable, but additional concessions could not be obtained. The company spent large sums in improving the canal, building concrete retaining walls, raising bridges, besides practically completing track and overhead between Cincinnati and Dayton. The system was designed for alternating-current towing locomotives, and these were used for a short time. Two years ago Cincinnati traction interests became interested in the proposition, and the control passed to Cincinnati, although the majority of the bonds are held in Cleveland. Financial difficulties overtook the company and it went into the hands of a receiver, who operated it for a short time. Since then the property has been standing idle, and has become badly disrupted, much of the overhead wire having been stolen. Opponents of the canal proposition now claim that the franchise is worthless by limitation, and it is stated that the extension which the company is supposed to have secured was never signed. The physical property was appraised at $190,000 about a year ago. There are claims for some $100,000 which antedate the bonds.

A CHANCE FOR CONTRACTORS

The Conestoga Traction Company, of Lancaster, Pa., is to build 35 miles of electric railway in Lancaster County this summer, work to start within two weeks. Fourteen miles of this road will be from Lancaster to Mt. Joy, and 17 miles from Lancaster to Christiana. The company contemplates doing the grading itself, but wants to contract for bridges, all masonry work and ballasting, for which it will be glad to receive bids.

REPORT OF CAR-BUILDING PLANT NEAR PITTSBURG

The report was current in New York last week that B. F. Jones, of the Jones & Laughlin Steel Company, and J. Dawson Callery, president of the Pittsburg Railways Company, were interested in a plan to erect a large street and steam railroad car building plant at Ambridge, Pa. It was said that a company would be organized with a capital of $10,000,000, and that the plans for the new enterprise had matured so far that all would soon be in readiness to begin actual construction work on the plant. The local office in New York of Jones & Loughlin referred all inquiries to Mr. Jones at Pittsburg. Mr. Callery, in a letter to the STREET RAILWAY JOURNAL, under date of May 8, says he has "no interest whatever in the car-building plant to be erected near Pittsburg," and that he is at a loss to understand how his name became associated with the undertaking.

A TUNNEL FOR THIRTY-FOURTH STREET, NEW YORK

In executive session as a committee of the whole the Rapid Transit Commission, on Thursday, April 4, decided to reject the scheme for a moving platform under Thirty-Fourth Street, and map out a four-track railroad under Thirty-Fourth Street from Third Avenue to Seventh Avenue, where it will tap the new Pennsylvania terminal. The successful bidders for the route will be allowed to continue it to the North River and on the East Side to the Thirty-Fourth Street ferry. This action is really in favor of the Metropolitan interests. Only one member voted for the platform subway, and that was, it is thought, John Claflin, who has shown himself to be favorably inclined to the project. The board will give the Schmidt & Gallatin syndicate, the owners of the moving platform patents, leave to apply for a franchise in some other street, but the feeling on the part of a majority of the board seems to be strong against the scheme.

CHICAGO A. I. E. E. TO DISCUSS SINGLE-PHASE TRACTION

The meeting of the Chicago branch of the American Institute of Electrical Engineers will be held at the rooms of the Western Society of Engineers in the Monadnock Building, Tuesday evening, May 23. At this meeting several subjects pertaining to single-phase electric railways will be discussed. The paper read in New York March 24 on "Line Construction for High-Pressure Electric Railroads," by George A. Damon, of Chicago, and the paper by Theodore Varney, of Pittsburg, on the same subject, will be presented for discussion, and in addition another paper, by James R. Cravath, entitled "Light Electric Railways," will be presented for the first time. The latter paper is intended to bring out a discussion on the possibility of building a cheap form of rural railway especially for use in some of the prosperous farming districts of the Middle West.

REPORT OF THE UNITED RAILROADS OF SAN FRANCISCO

The report of the United Railroads of San Francisco for the year ended Dec. 31, 1904, has just been issued. It shows an increase in gross receipts of $409,421 for the year, and an increase in net of $332,223. The increase in surplus was $84,156. A comparison of the reports for 1904, 1903, 1902 and 1901 follows:

	1904	1903	1902	1901
Gross receipts	$6,652,630	$6,243,219	$5,533,904	$5,125,883
Expenses, taxes, etc.	3,988,123	3,910,835	3,274,129	3,059,958
Net earnings	$2,664,507	$2,332,384	$2,259,775	$2,065,925
Other income	30,670	24,754	28,906	17,230
Total income	$2,695,177	$2,357,138	$2,288,681	$2,083,155
Charges, etc.	1,533,415	1,536,438	1,324,050	723,200
Balance	$1,161,762	$820,700	$964,631	$1,359,955
Sinking funds	257,052	123,999	114,000	84,000
Balance	$904,710	$696,701	$850,631	$1,275,955
Dividends	600,000	480,000	......	......
Surplus	$304,710	$216,701	......	......
Set aside*	161,353	157,500	......	......
Surplus	$143,357	$59,201	......	......

* Set aside for depreciation of equipment, etc.

The general balance sheet as of Dec. 31, 1904, compares as follows:

Assets	1904	1903	1902
Property and franchises	$71,281,621	$71,479,665	$71,610,669
Additions and betterments	3,079,078	2,556,741	1,125,516
Market St. Ry. bonds in trust	1,500,000	2,500,000	1,500,000
Mortgage sinking fund invest.	1,034,610	878,666	653,543
Improvements and betterm'ts.	......	40,020	930,314
Gold bond reserve	5,409,000	5,409,000	5,409,000
For underlying liens	9,866,000	9,866,000	9,866,000
Dep. for outstanding stock	32,528	42,540	53,898
Stock pro rata interest assets constituent companies	23,155,551	23,145,539	66,970
Material and supplies	472,915	352,881	357,362
So. S. F. R. R. & P. stock	1,350	1,350	......
Cash	315,762	542,991	667,958
Bills and accounts receivable	79,870	44,853	57,237
Unadjusted accounts	100,997	1,230	6,024
Taxes, etc., paid in advance	21,135	56,571	35,552
Miscellaneous	8,255	......	......
Total	$116,358,674	$115,918,049	$92,340,143

Liabilities	1904	1903	1902
Common stock	$20,000,000	$20,000,000	$20,000,000
Preferred stock	20,000,000	20,000,000	20,000,000
Four per cent gold bonds	35,275,000	35,275,000	35,275,000
Underlying bonds assumed	14,591,000	14,591,000	14,591,000
Liab. to outstanding stocks	23,188,080	23,188,080	53,893
Accounts payable	333,824	372,462	334,613
Wages and pay rolls	111,200	143,928	135,257
Miscellaneous	12,037	30,793	49,822
Bond interest	130,635	132,667	130,025
Interest accrued	335,090	351,816	351,722
Sinking funds	1,231,737	932,838	771,450
Sinking funds accrued	60,000	60,000	60,000
Insurance	200,000	200,000	176,238
Dividends	......	......	41,846
Depreciation and renewals	232,498	152,363	......
Profit and loss, surplus	637,572	488,348	369,272
Total	$116,358,674	$115,918,049	$92,340,143

In presenting the report President Holland said in part:

"The gross earnings of the road show a satisfactory increase, a period of moderate growth being now apparently followed by more favorable conditions.

"While an increase is also noted in the operating expenses and taxes, due to extensive repairs and renewals of rolling stock and power plants, track and overhead lines, as also to increased pay of car and house men, etc., for the full year in line with the arbitration award, yet on the basis of gross earnings a reduction is shown as compared with the preceding year:

For year 1904:	
Total revenue passengers carried	132,434,771
Total transfer passengers carried	64,527,294
Increase over previous year	5,563,946
Or	9.44%
Percentage of transfer to revenue passengers	48.72%

"Provision has been made for the first time for the sinking fund of 4 per cent gold bonds of this corporation, in accordance with the terms of the first general deed of trust, amounting for the year to $133,052.

"Additions to the company's properties have been continued during the year, the balance sheet showing the increase in additions and betterments of over $520,000 for that period, composed mainly of rolling stock, though other additions have been made to track, structures and fixtures, as also to power plant equipments.

"Buildings.—Various improvements have been made to the company's buildings.

"Since the preceding report a great improvement can be reported in the rolling stock equipment.

"The cost of fuel has been reduced the past year by the contract entered into with the Associated Oil Company for fuel oil. The present contract will expire on Dec. 31, 1905, and a new one has already been made with the same company for such fuel oil as the company will thereafter require, on favorable terms.

"It is incumbent upon this company to provide sub-station equipment at the present Bryant Avenue House, which will involve an outlay of about $105,000 within the present year.

"The arrangement is one of material benefit to this company, as the price for electric current is satisfactory, and outlays for future additional power station equipments will be reduced to a minimum."

THE CLEVELAND SITUATION

Events continue to develop in the Cleveland franchise fight. Last week the warring factions held a series of public discussions, in which Mayor Johnson further outlined his municipal leasing plan, heretofore referred to in these columns, and endeavored to induce the representatives of the company to commit themselves to a scheme for leasing the property or for lower fares. Mr. Andrews finally offered to submit a proposition before a representative body to be composed of members of the Council, the Chamber of Commerce and other representative organizations.

Going into the details of the leasing scheme, Mayor Johnson said that from data furnished by the company, his experts figured the physical value of the property to be about $55,000 per mile, including power stations, real estate, etc., or about $12,000,000 for the 217 miles of track. He claimed the average franchise life was six and one-half years, assuming that the outlying districts were worth less than the down-town districts. The gross receipts of the company have increased about 7 per cent per year for about nine years past. Taking out maintenance expenses he figured the net increase at 4 per cent, and on this basis he estimated the present worth of the franchises at $9,450,000. The two together would represent the actual value of the property were there no bonds, but deducting the value of the bonds there would be left about $12,450,000, which he claimed was the value of the stock. As the capital stock of the company is $23,400,000, the stock is, upon this basis, worth about $53 per share. He said he thought something should be allowed for good will, but did not venture to say what would be the monetary value.

Mr. Andrews called attention to the fact that when Mr. Johnson was at the head of the Detroit system he offered to sell the property to the city for $16,500,000, when it was earning less than half what the Cleveland Electric is to-day, and when its physical value was considerably less than half that of the Cleveland Company. This the Mayor did not deny. It was business with him then as it is now, only in the present instance he has to conserve the interests of the municipality.

Mr. Andrews said his directors were opposed to the leasing plan, as they desired to develop and operate the property, and he asked Mr. Johnson if he would recede from his stand of demanding straight 3-cent fares with universal transfers. The Mayor replied that he would favor any proposition which seemed to be satisfactory to the majority of the people, but added that he would veto any ordinance that he did not consider satisfactory to all. As the situation stands, the leasing proposition seems to be dead, and it is more than likely that the question will in its entirety be referred to the special committee of Councilmen and others mentioned previously.

The Cleveland Electric Railway scored an important victory against the 3-cent fare company in a decision by Judge Lawrence in a suit brought by a property owner to restrain the low-fare company from building on Central Avenue. Two weeks ago Judge Taylor decided that the franchise of the Cleveland Electric Railway on this route had expired. The decision by Judge Lawrence, however, holds that the franchise of the 3-cent fare company is invalid, because the city had granted it on a basis of a renewal of franchises where, as a matter of fact, the 3-cent fare company never had any rights on the street. In other words, the route should have been advertised, bids called for and consents of property owners obtained, as though for an original grant. By this decision both companies are without rights on the street.

ELECTRICITY ON LONG ISLAND IN JUNE

Tunnel No. 1 of the Atlantic Avenue, Brooklyn, improvement is now completed, and the Long Island Railroad track is laid in it from the eastern portal at Bedford Avenue down as far as Carlton Avenue. The third rail is laid from Vanderbilt Avenue in the tunnel to Belmont Park, in Queens County, a distance of 14 miles. The tracks are ballasted in the tunnel as far as Vanderbilt Avenue. It is expected that by June 15 all will be ready for the electrical operation of the line. Under the summer time-table, to go into effect about June 25, the entire Atlantic Avenue line will be operated by electricity through both tunnels, and there will be only two grade crossings on Atlantic Avenue, one at Fifth Avenue, the other at Sixth Avenue. These will remain only until the completion of the big underground station at Flatbush Avenue and Atlantic Avenue next year.

The work of excavating the two blocks between Vanderbilt Avenue and Sixth Avenue and Atlantic Avenue and Pacific Street, Brooklyn, for the new depressed Long Island Railroad freight yard, will be undertaken soon. The block between Vanderbilt Avenue and Carlton Avenue will be excavated to a depth of about 17 ft. The block between Carlton Avenue and Sixth Avenue will be excavated to the full depth at its eastern end, but will gradually rise to the street surface at its western end by a gradient of about 1 per cent. A concrete retaining wall will be built all along the Pacific Street front of the structure. A temporary plank retaining wall will be built alongside the Carlton Avenue front, to be taken away when the excavation of both blocks is completed, and Carlton Avenue will be carried over the depressed tunnel by means of a steel bridge. A retaining wall 20 ft. in depth is being built under the rear wall of the beef houses on Fort Greene Place, forming a foundation for those structures.

REPORT OF THE PITTSBURG RAILWAYS COMPANY.

The report of the Pittsburg Railways Company for the fiscal year ending March 31, 1905, was presented to the stockholders at the annual meeting held a few days ago in Pittsburg. James D. Callery, the president of the company, in reviewing the operations for the year, discussed the new extensions, the work accomplished during the year, and briefly referred to some of the plans for the future. During the year the company built 18.73 miles of new track, making the total mileage 464.29 miles. This new trackage is of greater significance than is indicated by the figures. The completion of the Mt. Washington tunnel afforded the Charleroi line a terminal in the city The company has practically completed the Brunot Island power house, which was put in commission on Oct. 18, 1904. The operation of this plant has enabled the management to close down the West End and Birmingham power stations, and the Coraopolis and Carnegie sub-stations, and the suburban power station during the hours of light travel. The Brunot Island power plant is also furnishing a large supply of alternating current for the Allegheny County Light Company.

The power plants, tracks, cars, buildings and equipment have all been maintained in thorough repair. The account of maintenance of ways and structures shows a marked increase, owing to the extraordinary outlay for repaving streets to meet the requirements of city ordinances, also to the repairs to bridges, buildings and structures on various parts of the system. A considerable portion of these expenditures were in the nature of permanent betterments.

The gross receipts from the operations of the company show a decrease, caused by the general depression in business during the year 1904. Since Jan. 1, 1905, the receipts show an increase, and it is anticipated that with a better feeling in the business community and the general employment of labor, the receipts for the year 1905 will be more satisfactory.

The company has purchased no cars during the past year, but recommends the purchase of at least 100 large double-truck closed cars to meet the requirements of the increased business, and to handle its business on certain lines more economically and satisfactorily.

To provide additional storage and operating car houses the company has under construction a large storage car house and yards at Homewood, and will construct during the year car houses at Avalon, Mt. Washington and Wilmerding.

The statement of earnings for the year follows:

PITTSBURG RAILWAYS COMPANY

Income Account for Year Ended March 31, 1905

Gross earnings from operations			$8,569,476
Operating Expenses:			
General expenses		$724,915	
Conducting transportation		$2,767,707	
Maintenance of way and structures		561,967	
Maintenance of equipment		592,561	
Park expenses		37,101	
Total operating expenses		$4,684,252	
Bridge tolls		113,904	
Taxes		352,487	
Total operating expenses and taxes			$5,150,644
Net earnings			$3,418,832
Other Income:			
Rent of buildings and real estate		$69,194	
Dividends on stocks owned		50	
Interest and discount		8,075	
Miscellaneous		18,400	
Total other income			$95,719
Total income			$3,514,551
Deductions from Income:			
Rentals of leased properties:			
United Traction Company, of Pittsburg	$520,784		
Consolidated Traction Company	1,495,848		
Brunot Island power station	20,056		
		$2,036,688	
Miscellaneous interest and discount		168,549	
Tenement expenses		8,031	
Total deductions from income			$2,213,269
Net income			$1,301,281
Fixed Charges:			
Interest on funded debt of Pittsburg Railways Company and leased companies			$1,582,833
Deficit for year			$281,551
Passengers carried			172,562,625
Car mileage, miles			32,655,426
Earnings per car-mile			$.2624
Expenses per car-mile (including taxes)			.1577
Net earnings per car-mile			.1047

MIDDENDORF-WILLIAMS RESUME

In 1903 John L. Williams & Sons, of Richmond, Va., and J. W. Middendorf & Company, associated in the promotion of railroad, electric railway, lighting and public service enterprises, were compelled to ask an extension of credit. Their debts reached the sum of $12,000,000. Immediately there was formed an advisory committee, and under its direction the two firms proceeded to manage the liquidation of their assets, which has been successfully accomplished. This advisory committee was composed of Robert C. Davidson, chairman; John B. Ramsay, president of the National Mechanics' Bank; Douglas H. Gordon, president of the International Trust Company; Eugene Levering, president of the National Bank of Commerce, and Douglas H. Thomas, president of the Merchants' National Bank, all of Baltimore; Eppa Hunton, Jr., of Richmond, Va., and Frank O. Briggs, Jr., Trenton, N. J.

Among the assets of the two firms, says the "Philadelphia News Bureau," were 140,000 shares of stock of the Seaboard Air Line Railway, which were bought by the Ryan-Blair syndicate at $15 a share for the common stock and $25 a share for the preferred stock. There were large blocks of stocks and bonds of street railway, electric light, coal and iron properties, banks and trust companies, and the process of liquidation was carried on with marked success. The two firms agreed, when they suspended, that any surplus from the assets of one should go to make up the deficiency, if any, in the assets of the other. As it worked out both have a surplus.

ANNUAL MEETING OF THE TECHNICAL PUBLICITY ASSOCIATION

The annual meeting of this association, which is composed of the members of the publicity and advertising departments of a large number of prominent manufacturing companies, was held in New York on April 27, and was attended by some thirty-five gentlemen, representing about the same number of different manufacturing corporations. The address of the evening was delivered by E. P. Harris, who described the three great departments of human effort in making the crude treasures of the earth available to the service of man as mining, manufacturing and marketing. The work of marketing may, in turn, be classed under the heads of the merchandise, the message and the medium. The officers of the publicity departments are the engineers of marketing, and upon them depends the responsibility of properly selecting the medium and framing the message. The keynote of the ideal technical or trade paper, or the medium to the consumers, is helpfulness to its readers, and this in turn depends upon the editor's knowledge of the wants of the reader and the reader's confidence in the accuracy, reliability and truthfulness of the contents of the paper. The mood which the editor inspires in the pages of which he has direct charge is carried over by the reader to the advertising pages, and it is of great importance whether the reader is inspired with confidence, optimism and enterprise. The editor has practically canceled the work of the advertiser if the reader has been placed on the defensive. It costs little to get a few subscribers in any field, and to do business on these and a few sample copies. Such papers can make low rates, but the space is likely to be dear at any price. The advertiser should know the exact circulation of the paper in which he advertises and the classes of people who read it. Great progress has been made in the past ten years in the development of a higher type of technical journal, and it is even proper to refer to it as the modern selling machine.

D. R. FRANCIS, OF ST. LOUIS, IN IMPORTANT IOWA PROJECT

D. R. Francis, the director-general of the Louisiana Purchase Exposition, and his associates are interested in an important project in Iowa. They have outlined a plan for taking over the Oskaloosa Traction & Light Company and the Ottumwa Traction & Light Company, for which they say they have options of purchase, and building an interurban line from Oskaloosa to Buxton and the coal regions in Mahaska, Marion and Monroe Counties. To carry out this plan it is proposed to organize a company with a capital stock of $4,500,000, of which $3,000,000 shall be issued at once. Bonds to the amount of $3,000,000 will also be authorized. These will be drawn for twenty years, to bear interest at 5 per cent, and of the total amount $2,000,000 will be issued at once. Included in the purchases to be made by the new company will be the rights of an interuban company which owns grants for a line from Ottumwa by way of Eddyville to Givin.

The proposition as above outlined was discussed at a meeting of business men in Oskaloosa on Friday afternoon, April 28. At this session it was decided to call a mass meeting of the citizens, to be held the same evening in the court house, to settle the question of subscribing the $100,000 worth of stock and guaranteeing the right of way for the line between Oskaloosa and Buxton. At the mass meeting, which was unanimous in favoring the acceptance of the proposition offered, the $100,000 subscription of stock was pledged, and it was decided to guarantee the right of way, as it was known that the farmers along the proposed route would donate the land necessary in order to secure the road. Mr. Francis and his associates have been notified, and it is now expected that the new company will be organized at once. It is understood that the company will have a directorate of seven members, one of whom will be a resident of Oskaloosa. The $1,500,000 of capital stock, and the $1,000,000 of bonds, which are not to be issued at this time, will be held in reserve, for the future betterment of the property, extensions, acquisitions, etc. The options on the traction and light companies of the two cities expire May 22, 1905.

IMPORTANT COURT DECISION IN CHICAGO

Judge Peter S. Grosscup, on Monday, May 8, denied the right of the Union Traction Company to an injunction restraining the city from interfering with the tracks of the Chicago Passenger Railway Company, holding that the ordinance of 1884, under which the franchises for the company were granted, was intended only to run for twenty years. Later, on motion of Attorney John S. Miller, for the traction company, and on agreement of Corporation Counsel Tolman, Judge Grosscup said he would enter an order dismissing the bill for injunction for the want of equity. Judge Grosscup said he had not taken this case under consideration until recently, because he believed a settlement of the traction question would preclude the necessity of a decision in the case. When he received official notification from Corporation Counsel Tolman that there was no immediate likelihood of a settlement in the matter he took the case up. The court holds that the franchise of the company expired last year, and that the issuance of the same dates back to 1884 instead of 1887. If he had held for the company the franchise would then have remained until 1907, it being the claim of the traction people that the franchise dated from 1887.

In concluding the decision Judge Grosscup said:

"The question presented is not without its difficulties. I am not sure that the conclusion to which I have come is the right one. The only ground upon which I have to act is that, looking at the ordinances before me as the mirror of what was in the mind and purposes of the Council and the Passenger Railway Company twenty years ago, I am inclined more to the belief that the ordinance of 1887 was intended to run only for the remainder of the periods which the preceding ordinances had, by their terms, yet to run; than to the belief that it was intended to run for twenty years from the latter date; and upon that state of my views the motion for an injunction must be denied."

This decision is of considerable importance. It makes the company a trespasser, and opens the way for the city to municipal ownership of a short stretch of line on Adams, Clark, Desplaines, Harrison, Western and Twelfth Streets to the city limits. If the company is disposed to sell the property the city can acquire and operate it, or it can build a new line over the route as soon as the company shall have removed its property. No policy has as yet been formulated by the city regarding the decision.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED APRIL 25, 1905

787,944. Motor Suspension for Trucks, etc; William G. Price, Kingston, N. Y. App. filed Oct. 17, 1903. Consists of a plurality of motor casings, each supported upon an axle, a truck-frame and a bracket, extending from said motor casings and resiliently supported upon the truck frame, resting in contact one with another and free from positive connection.

787,888. Fulcrum Block for Brake Beams; Carl E. Bauer, Hammond, Ind. App. filed Sept. 2, 1903. A brake beam fulcrum comprising a member embracing the base and one side of the flange of the beam, and a locking member attached to the other member by a tongue-and-grove joint.

787,938. Roller Side Bearing for Railway Cars; John F. O'Connor, Chicago, Ill. App. filed Jan. 28, 1905. A device for regulating or positioning the bearing roller, consisting of a bent lever extending axially through the roller and having an arm provided with a pivot member fitting in and extending through a closed slot in the lower bearing-plate, and its other or upright arm furnished with a pivot member fitting in an open slot in the upper bearing-plate.

788,125. Car Structure and Bolster; Henry H. Vaughan, Cleveland, Ohio. App. filed Dec. 9, 1903. A bolster provided with rigid lugs integral with the central portion of the bolster, and which project from the opposite sides of the bolster in a direction longitudinally of the car for the attachment of draft and abutting beams, said lugs having lateral abutments for parts of the draft and abutting beams.

788,166. Electrical System of Heating; Arthur D. Newton, Hartford, Conn. App. filed July 9, 1904. The heating circuit is controlled by a thermostat.

788,186. Automatic Railway Switch Adjuster; Lloyd C. Brown, Wichita, Kan. App. filed July 27, 1904. Relates to details of apparatus for throwing a switch from a moving car.

788,280. Electric Railway; Leon W. Pullen, Philadelphia, Pa. App. filed July 18, 1904. Contact mechanism in which a magnet on the car operates a tubular armature to close the supply circuit.

UNITED STATES PATENTS ISSUED MAY 2, 1905

788,526. Electric Trolley Wheel; Theophile Euphrat, Norwalk, Conn. App. filed Aug. 25, 1904. Two cutter-carrying discs mounted on opposite sides of the trolley wheel, the wheel having perforations there for the cutters, whereby they engage the wire to remove ice therefrom, and means for throwing the discs into and out of engagement.

788,556. Brake Beam; Edward Posson, Austin, Ill. App. filed

Jan. 7, 1905. Consists of an I-shaped portion, having its web intersected longitudinally by a central tubular portion integral therewith and extending the entire length of the beam.

788,559. Brake-Shoe; William M. Simpson, Chicago, Ill. App. filed March 18, 1904. A composite brake-shoe consisting of soft-metal inserts embedded in a comparatively hard metal body, the inserts being secured together and the body of the shoe strengthened by metal strips located at the back of the shoe.

788,687. Transom or Body Bolster for Railway Cars; John C. Wands, St. Louis, Mo. App. filed Feb. 27, 1905. Roller bearings upon the bolster, having pedestals arranged thereupon carrying hangers upon which is hung a sectional body bolster.

788,690. Brake-Shoe; Harry H. Wright, Chicago, Ill. App. filed Oct. 19, 1904. Comprises a cast-metal body having metal bars extending along the back of the shoe, and a reinforce staple or strip embedded in the lug and having its ends bent outwardly and extending under the longitudinal bars at the back of the shoe.

788,699. Railway Switch; Chauncey A. Bisbee, Seattle, Wash. App. filed Aug. 11, 1904. Details.

788,850. Brake Head; Fitz W. Sargent, Mahwah, N. J. App. filed April 6, 1904. Comprises a generally U-shaped wrought metal plate, bent to conform to the shoe back and having wings for attaching to the brake beam.

788,948. Vestibule; Thomas A. Ryan, Yonkers, N. Y. App. filed Aug. 17, 1904. Folding wing sections, adapted to form a V-shaped partition behind the motorman, thereby forming a shelter for the motorman and at the same time permitting ingress and egress to and from the car independent of said shelter or vestibule.

788,949. Brake-Shoe; Fitz W. Sargent, Mahwah, N. J. App. filed Feb. 8, 1904. A brake-shoe having a resilient-compressible attaching lug thereon.

788,990. System of Electric Car Lighting; Richard D. Apperson and Albert J. Kohler, Lynchburg, Va. App. filed March 24, 1904. Suitable switches mounted on top of the car, whereby when the trolley is swung around the proper circuits will be closed to illuminate the various signal lights of the car.

788,993. Railway Switch; Thomas K. Bell, Camden, N. J. App. filed Dec. 1, 1904. Provides an overhanging protector for the heel portion of the tongue and means for the ready removal of the tongue from the switch structure; also means for supporting the heel portion of the tongue and for taking up any wear at the heel.

789,014. Trolley; Charles M. Feist, Sioux City, Ia. App. filed Aug. 24, 1904. Details of a self-lubricated wheel.

789,056. Brake-Operating Mechanism for Vehicles; John L. Peacock, Buffalo, N. Y. App. filed July 28, 1904. Relates more particularly to the construction of the brake drum.

789,057. Brake-Operating Mechanism for Vehicles; John L. Peacock, Buffalo, N. Y. App. filed July 28, 1904. See preceding patent.

789,072. Truck Bearing; William H. Scott, Maplewood, Mo. App. filed Dec. 19, 1904. One of the objects of the invention is to provide means whereby the body-bolster, or transom, may have a transverse swinging movement independent of any movement of the truck bolster.

PERSONAL MENTION

MR. JOHN C. FETZER has resigned as managing receiver of the Union Traction, of Chicago.

MR. J. T. DARLING has resigned as secretary of the Montgomery Street Railway Company, of Montgomery, Ala.

MR. GEORGE PARRY has been appointed superintendent of the Pennsylvania & Mahoning Valley Railway lines west of Girard, with headquarters at Niles, Ohio.

MR. A. L. C. FELL, chief officer of the London County Council Tramways, is making a visit to this country, and spent a portion of last week in attendance at the International Railway Congress at Washington. Mr. Fell is making a tour of inspection of the principal tramway systems in this country.

MR. A. M. STEWART, formerly division superintendent of the Montclair line of the Public Service Corporation, has been appointed to the position of superintendent of District No. 2 of that company, including all Newark lines, in place of Mr. A. W. Pratt, who has been assigned to other duties.

MR. J. BUNTZEN, resident manager in Vancouver, B. C., of the British Columbia Electric Railway Company, has been elected managing director of the company, with offices in London, England. His successor in British Columbia will be Mr. R. H. Sperling, who has been general superintendent of the company.

MR. DOW S. SMITH, superintendent of the Brooklyn Rapid Transit Company, was surprised at his home, in Bay Ridge, Brooklyn, one evening last week by the employees of the company. The occasion was the thirty-eighth anniversary of Mr. Smith's birthday. The serenaders were accompanied by the employees' band, the members of which are engaged mostly in train and car service.

MR. I. N. REED, who has resigned as assistant to Mr. William Pestell, of J. G. White & Company, of New York, has become connected with Sanderson & Porter, of New York, for whom he will travel extensively on large engineering undertakings. Mr. Reed was assistant to Mr. Pestell in Worcester, Mass., when the latter had charge of the reconstruction of the Worcester Consolidated Railway Company's plant. Prior to his going with Mr. Pestell, Mr. Reed held for some time the position of mechanical engineer with the Baltimore Copper Company.

MR. ALBERT S. CRANE has been appointed chief hydraulic engineer of J. G. White & Company, of New York. Mr. Crane was born in 1867, and graduated from Cornell University in 1891. Since graduation he has been actively engaged in hydraulic work. From 1898 to 1901 he was engaged on the developments of the Michigan & Lake Superior Power Company at Sault Ste. Marie, in the capacity of chief assistant engineer; and, supplementing this connection, was chief engineer of the Lake Superior Power Company of the same place until 1902. Since 1902 he has been engaged, under the general direction of Mr. Isham Randolph, as principal assistant engineer of the sanitary district of Chicago, in charge of the design and construction of the 30,000-hp water-power plant on the Chicago Drainage Canal. Mr. Crane has also been engineer for the 6000-hp water-power development at Marseilles, Ill., and has acted in the capacity of consulting engineer on various smaller hydraulic undertakings. During the earlier portion of his engineering career Mr. Crane, as chief hydraulic engineer of J. G. White & Company, will be in responsible charge of the hydraulic department.

MR. C. W. RICKER, who for the past year has been connected with the electric traction department of the New York Central & Hudson River Railroad Company, has just accepted the position of electrical superintendent of power stations of the Interborough Rapid Transit Company. Mr. Ricker will make his headquarters at the Fifty-Ninth Street station of the company. His appointment to this important position follows an experience of some fifteen years in electrical engineering, during which he has had charge of many important installations. Mr. Ricker is a graduate in electrical engineering of the class of 1891 of the Massachusetts Institute of Technology, and after graduation entered the employ of the American Telephone & Telegraph Company, in New York. In 1892 he took the student's course with the General Electric Company, at its Lynn works, and the following year opened an office as a consulting engineer in Buffalo, where he remained six years. During this time he was engaged on a number of important installations, among them that of the mechanical engineering of the Husted Milling & Elevator Company, and of the electrical engineering of the Buffalo Traction Company, and of the Niagara Gorge Railway. In 1899 he accepted the position of electrical engineer of the United Electric Securities Company, of Boston, and the following year became assistant to Mr. Theodore Stebbins, engineer of the Local Companies' Department of the General Electric Company. While engaged on this work he was appointed engineer in charge of the Lima Electric Railway & Light Company, of Lima, Ohio, and upon completion of the work with which he was entrusted there, entered the employ of the Cleveland Construction Company, of Akron, Ohio. His work with this company included reports on extensions of several other railways in which that company was interested, such as the Aurora, Elgin & Chicago, and the Elgin, Aurora & Southern Railways, and acting as supervising engineer of the Springfield & Xenia Traction Company and of the Miami & Erie Canal Transportation Company. This latter work included the installation of the complete alternating-current plant of that company, including 33,000-volt transmission and alternating-current locomotives for towing canal boats. This installation was described by Mr. Ricker in the STREET RAILWAY JOURNAL of Nov. 7, 1903. Upon the completion of the construction of this line he accepted the position of electrical engineer of the company. In 1904 he resigned from that company to enter the electrical engineering department of the New York Central Railroad, as already mentioned.


C. W. RICKER

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REMITTANCES.—Remittances should be made by check, New York draft or money order in favor of Street Railway Journal.
CHANGE OF ADDRESS.—The old address should be given as well as the new, and notice should be received a week in advance of the desired change.

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 8000 copies are printed. Total circulation for 1905, to date, 164,850 copies— an average of 8242 copies per week.

Legible Destination Signs

If there is any one little thing that can cause more annoyance and delay in the operation of a street railway system than another it is an illegible type of destination sign. A few years ago there was a general waking up to the necessity of destination signs which would be readable both by day and night. The great majority of roads have adopted illuminated signs, but unfortunately many of these signs were not well designed or, while very satisfactory at first, did not stand up well in the long run. A sign to be legible at a distance must have a very clean cut lettering. Each letter must stand out distinctly from other letters, and the style of lettering must be such that different parts of a letter do not run into each other so as to make the letter illegible at a distance. The illumination of a sign is a study in itself, as it is quite possible to have a sign which reads well from one angle and is illegible from another. Perhaps, however, the greatest trouble with destination signs is lack of care in their maintenance. It is quite frequently necessary to overhaul and repaint signs more frequently than the cars which carry them, because dinginess in a sign makes it illegible. Dinginess of a car simply makes it less presentable. Illegible signs are a source of exasperation to would-be passengers and cause many cars to be stopped unnecessarily because the passengers cannot read the signs. One certainly cannot blame a passenger for stopping every car that comes along until he gets the right one if he is not able to read the signs before the car reaches him. The cost of power alone to make these unnecessary stops would pay for considerable attention to signs, to say nothing of the increased respect which the company will have in the eyes of the traveling public.

Paying Trainmen Every Day

Our Question Box has served to bring out some decided differences of opinion among managers as to certain operating points. When the reasons for these differences of opinion are given in answering questions, the Question Box serves as an admirable presentation of the points for and against these disputed practices. One of the points upon which a most decided difference of opinion has been shown is in regard to paying the conductors and motormen daily as they turn in their receipts. This is a practice which has been followed for a number of years by several companies in the Western half of the United States. Its condemnation by Eastern managers is probably due to the fact that many of them are not familiar with the practice and do not know how successfully it has been used. Without taking sides in the controversy, it may be well for us to present here the principal arguments used by the managers of these Western companies in defending their practice. The plan is for the conductor to figure up his time and that of the motorman on his trip sheet before he turns it in and to deduct his pay and that of the motorman from the money he has taken in before he turns it in to the receiver. Details of the plan differ, but if our memory serves us right, the trip sheet is usually made so that it appears as a receipt for the wages and is signed by the motorman and conductor. The plan is very simple and does away with considerable of the work of making out a pay-roll once or twice a month. It distributes this work evenly over the entire month, and it can easily be seen how it may save some clerical labor. The chief advantages, however, are that it does away with all disputes and complaints by the men as to mistakes, and that it removes temptation from that class of employees whose money burns their pockets when they get paid monthly or semi-monthly. A man is much less likely to be extravagant, to run into debt, or indulge in dissipation if he is paid daily than if money comes in larger sums, monthly or semi-monthly. It is also believed by some managers that, other things being equal, a good man will prefer to work for the company which pays daily rather than one which pays monthly. In a town where there are strong inducements to go into other work, this is a consideration. Anything that tends to attract the best men and to keep them good, steady, desirable employees is worth thinking about.

The Half-Fare Problem

The recent decision of the Supreme Court of Massachusetts that the statute is constitutional which requires street railway companies to carry school children at rates not exceeding half the regular fare charged other passengers, furnishes an example of the tendency of legislative and judicial bodies to assume wide responsibilities in dealing with complex questions which cannot be solved without expert knowledge. The court assumes that the fixing of relative rates by law is naturally proper, but that a company is not to be required to conduct its business at a loss, since if such conditions were imposed, the result would be a taking of property without due process of law. It is this wise provision in our National Constitution which gives stability to our property values, and makes them largely independent of socialistic attempts at confiscation by erratic legislative action. In the case in point the court gave its opinion that the Legislature in framing the law believed that no loss would be entailed upon the companies by its passage, as pupils would be going and coming from schools at hours when other passengers would be few; that since the statute places no limitation upon the rates that may be charged generally there is nothing in it to prevent the street railways from making their fares within the limits of a town 6 cents or 7 cents; and finally, that the law may even go to the extent of requiring children to be carried free by street railways, in the interest of popular education, but that in such cases the taxpayers of the community, and not the street railway companies or their passengers, should be compelled to meet the expense.

The determination of rates by legislative bodies is a very serious matter in any industry, and it is particularly so in the case of street railways. Reasonable returns upon invested capital are rightly demanded by all those who share in the ownership of property, and it is certainly a task for the specialist to determine how far rates may equitably be raised or lowered in a business as intricate as the street railway conducted under present-day conditions. In fact, we have only to look at the many days of debate and investigation which occupied the Congress just ended to discover that opinion in the highest law-making body of the land is singularly variable as to the expediency of enacting specific legislation upon the business of interstate transportation. Furthermore, the operating conditions under which different street railways conduct their business vary so widely, even in the same country, that a sweeping decision affecting all the companies in a given State runs the gravest risk of perpetrating gross injustice somewhere. An examination of the annual reports of even the largest companies, operating in territory where the traffic is exceedingly heavy, shows that the mere operating cost of carrying a passenger rarely falls below 2¾ cents or 3 cents, leaving fixed charges out of the question. According to the figures of the United States Census Bureau for 1902, covering practically every mile of operating street railway track in the country, it cost 2.88 cents (operating expenses) to carry each passenger. Fixed charges, excluding depreciation, amounted to over a cent and a half in addition, leaving less than a third of a cent for dividends.

The fact that street railways have in some cases voluntarily agreed with towns to give half-fares to school children in order to secure franchises in the street is no evidence that companies can do this without resulting financial loss. It practically means in such cases that the franchise carries a pretty substantial fixed charge. In some of these cases it is by no means certain that the franchises have not cost too dearly, and that the school rate has been borne at a loss, while the regular 5-cent fare barely sufficed to pay operating expenses and fixed charges.

In most cities it is at the present time out of the question to increase fares generally, to make up the loss which the half-fare for school children carries. Under the pressure of municipal ownership cranks and political demagogues, it is often a matter of some difficulty to maintain the exceedingly low rates of urban fare now in force. Six-cent or 7-cent fares applied generally for the benefit of any special class, worthy as that class may be, are certainly inexpedient under the conditions of to-day. As a matter of fact, many thousands of children below the age limit are to-day being carried free by the street railways, although, as a general rule, paying passengers have the privilege of a seat in crowded cars as compared with those carried free. Theoretically, there is no reason why a child can be carried at less expense than a 200-lb. adult. The difference in weight is more than made up by the greater care required on the part of the conductor to prevent accidents, as children are notoriously heedless in boarding and leaving cars. Moreover, if class distinctions of any sort are to be set up, it is hard to know where, in justice, to draw the line. Innumerable opportunities for deception await the unscrupulous in connection with reduced fares for a special class; the blind man in straitened circumstances may as reasonably claim a fare reduction because he is obliged to ride daily, as the school boy, and so the list may be enlarged. Certainly, the street railway must offer the same reasonable terms to all classes of people if it is to do justice. Personal sympathy for the unfortunates of every condition is an admirable thing in its place, but it is hard to see how a street railway company operating under the trying conditions of American life can discriminate fairly between its patrons.

If the State believes that it has the right to enforce the attendance of children upon its schools—and most enlightened Commonwealths so believe—it logically may provide money for the transportation of children between their homes and the schools on the same grounds that it provides books and other necessary equipment free of cost. It is difficult to see why either the street railway or its passengers as a whole should bear the burden of this extra expense, which so plainly devolves upon the State—that is, the taxpaying body as a whole. And that this extra expense exists is not to be doubted if the financial results of present-day street railway operation are carefully analyzed. It is often forgotten that a reduction of 1 cent or 2 cents from a 5-cent fare cuts down the corresponding receipts from 20 per cent to 40 per cent—a loss in earnings that few modern businesses can bear without a severe stiffening of the rates as a whole. Finally, if more detailed information were possessed by legislators in regard to the conduct of the street railway business, there is every reason to believe that the passage of laws liable to operate unfairly upon specific companies would be notably decreased in volume.

Papers on Electric Traction at the Railroad Convention

Abstracts of three of the announced papers dealing with this topic were published in our last issue and the fourth is printed in this number, together with the address of Dr. Schulz, of the Imperial German Railways, on the Zossen tests and an abstract of the discussion. To judge the four regular papers properly, two facts should be borne in mind. The first is that the abstracts printed are very small portions of the original papers. Thus, the paper of F. Paul-Dubois, which we have reproduced in 6500 words, contains in the original about 58,000 words, accompanied by some seventy illustrations and diagrams of the installations described. Mr. Gerard's paper, which the limits of our columns required to be published in an abstract of 2000 words, appears in the original clothed in 35,000 words, including descriptions of the multiple-unit systems used, statistics of the power stations, etc. The papers by Messrs. Tremontani and Young were reduced in almost the same proportions. The second fact which should be remembered is that the authors were not expected to outline the future development of the subject discussed by them. The papers are termed "reports," and were designed to be what their name implies, i. e., progress reports, or descriptions of what had been accomplished during the past five years in the respective countries considered. For this reason the papers do not describe apparatus or methods which are new to anyone who has followed the progress of electric traction carefully during the past five years, although Mr. Dubois' paper presents some very interesting and hitherto unpublished figures on the cost of operation of the lines described by him. The debate was also of the same character, in that little or no attempt was made to delve into the future and determine the possibilities of electric traction.

We consider that this in a sense was unfortunate, although we realize that it is not within the avowed scope of the Congress, whose object is more to standardize practice than to determine the future possibilities in any particular direction. Nevertheless, the figures presented in the papers at the Congress, especially by Messrs. Dubois and Tremontani, are of great interest, especially on account of the fact that each of these gentlemen has had an extended experience in this branch of the work, and so far as he discusses the future, speaks most encouragingly. We notice a slight difference of testimony between these two papers as regards the economy of electricity over the use of steam. On Mr. Dubois' own road, the Paris-Orleans, the cost of electric traction was appreciably higher per train-mile than the average steam figures for the rest of the line, although this was readily explained by the fact that the electric locomotives were engaged largely in switching, where the economy of any motive power is low compared to straight runs. On the other hand, Mr. Tremontani found from carefully collected data on coal consumption that at speeds between 50 m.p.h. and 60 m.p.h. the fuel required per train-mile with electric traction was almost exactly two-thirds of that required for the same train service with locomotives. This is in close accordance with the estimates which have been made for this saving by various engineers. Of greater interest, however, is both authors' confirmation of the lessened cost of maintenance, both of rolling stock and of track, due to electric traction. This advantage has been often enough brought forward, but has been met by all sorts of doubts, based upon the hard experience of the early electric tramways. The early advocates of electric locomotives denounced the hammering of the reciprocating steam locomotive as deadly to track, and the railway man retorted by pointing the finger of scorn at the low joints so much in evidence on early electric roads. The Italian and French experience, however, has been that the change to electric traction materially reduces the cost of maintenance of way. Another point worth noting is the saving due to the absence of smoke, which greatly reduces the labor of cleaning.

As regards the future, particularly in connection with the distribution system, the authors seem to be somewhat at sea—like all the rest of us. It is obvious that serious railroading with 500-700 volts on the working conductor is out of the question, save in the case of enormously dense traffic, although the way out of the difficulty is by no means clear. One of the interesting side lights upon this question is to be found in the paper of Mr. Dubois, who discusses at some length the French attempts at a high-voltage three-wire system with continuous currents. His judgment is upon the whole decidedly adverse, as might indeed have been predicted from the various trials of three-wire traction in this country. It has uniformly proved good enough to be encouraging at the start and in the long run disappointing. For other methods of distribution all hands regard polyphase working as useful, but greatly limited in its applicability, and all look forward somewhat hopefully to the single-phase traction, now in its experimental stage. It is granted that this method will give a simple and business-like solution of the distribution difficulty, provided that the motors prove to be what they claim to be. This is a vital question which is now being tried out on both sides of the Atlantic.

Mr. Gerard's description of the English and Belgian work in the larger electric traction covers a good bit of detail as to equipment, but shows no radical departure from American heavy interurban service by so-called standard methods. The fourth rail, however, deserves mention, as a possible forerunner of five and six rails when somebody imagines a use for them. Mr. Young's paper, taking up the American practice of electric traction by steam railroad systems, was of necessity reminiscent of the famous chapter "On Snakes in Ireland," but he had at least the comfort of knowing that work on a large scale is under way, although not yet ready to be reported. Electric traction by steam roads has only in a very few instances in this country risen above the benevolent assimilation of competing trolley lines. Out of all this description and discussion rises the conspicuous fact that as yet very little has been done, either here or abroad, to the solution of the larger problems of electric railroading. The work on the New York Central will be the first really considerable break from tradition, even if it does not bring any radical innovations in method. It will give, however, an opportunity at last for a study of the problems of traffic handling on a large scale by methods exclusively electric, and this study will be productive of results. It is singular, however, to note how little real headway toward the larger electric traction has actually been made in fifteen years of intense activity in electric railway building. The tramway work of the world has been absolutely revolutionized, suburban and interurban work has been organized, the locomotive has been driven from use on elevated roads, but still the greater work lags. The high-speed electric train has been in view over and over, only to vanish like a mirage. And the work of the International Railway Congress conveys the impression of interested attentiveness rather than any definite promise of hopeful activity.

A DEPARTURE IN REPAIR SHOP ACCOUNTING

An interesting method of caring for repairs, and one which incidentally throws some light on the much debated subject of depreciation, has been conducted for several years on the South Jersey Division of the Public Service Corporation and on the system of its predecessor, the Camden & Suburban Railway Company. The plan was instituted by W. E. Harrington, for a long time general manager of the system, and differentiates between the shop cost in labor and material for repairs on rolling stock which are entailed directly by the operation of the line and that required for complete overhauling. Besides simplifying the work, the plan permits the overhauling of trucks, cars and their equipment by contract, so that the cost is known in advance. It also allows the company to expand or retrench easily in those repairs which are not immediately essential to the operation of the cars, or even to cut them off temporarily altogether. While not directly solving the question as to the difference between operating repairs, depreciation and betterments, the plan furnishes a clue to it and provides such an exact system for estimating repairs that a satisfactory budget can be prepared at the beginning of the year of charges of this character. Incidentally, the plan has proved very satisfactory to the repair shop force, as well as economical to the company in time and money.

To understand the system, it should be stated that all repair work, except that required for the bare operation of cars, is done by estimate. By operation of cars is understood such work as the substitution of a new pair of wheels, change of brushes, repair of bell rope, trolley pole or fender, touching up of scratches, etc., that is to say, those repairs which are absolutely required to keep the car in operating condition on the road. The work done by estimate includes all overhauling of trucks, electrical equipment of car body, painting, etc. Some particulars of the accounting methods followed in the repair shop were published on page 1080 of the STREET RAILWAY JOURNAL for Dec. 26, 1903, but they will briefly be referred to here. The company some time ago made a so-called "contract" with its master mechanic for the repair of its cars. This contract is really an agreement, fixing a certain price for all the different essential operations in car repair, which price the master mechanic endeavors to live up to. The arrangement was made in May, 1903, when the master mechanic agreed to effect a saving of 15 per cent on the net cost of repairs, which up to that time had amounted to 1.66 cents per car-mile. It also includes the proviso that the average number of times in which a car shall be in the repair shop will not exceed 1.11 times per 1000 miles run.

To facilitate matters, the overhauling work and the ordinary repair shop work are done in different shops. No work is undertaken in the overhauling shops, known popularly as the "K. A." shops, until a statement of the estimated cost has been submitted to the general manager by the master mechanic and chief engineer and approved by him. A typical form employed for estimating upon this work is shown in form No. 146, on which the items for labor and material are given separately.

As soon as an order of this kind is authorized it is given an order number. In this case the order number given is 20,781. As the work progresses and as the material sheets are sent in to the main office from the stock room, the cost of the stock required for this particular order is transferred on to small cards, which are kept together and totalized daily until the order is completed. The cost for labor is kept by the master mechanic's clerk on another sheet, which is also carried forward from day to day until the order is completed, when the cost of material is added from the card shown on the next page and the final cost obtained. A record of the completed job, as shown by the second blank on the next page, is then prepared. The method of tabulating the labor cost, bonus, etc., is shown by the third card reproduced.

Copies of these reports showing the progress of the work are laid on the general manager's desk daily, together with a statement of the entire work when completed. This statement is attached to the original estimate, so that the manager can dictate to the chief engineer any comment which he sees fit, either critical or commendatory. A carbon copy of this typewritten statement of cost is also sent to the chief engineer. The object of handing the daily report to the general manager is so that

FORM NO. 146. 19810-6-12-03. 10 Books. №. 33

Camden and Suburban Railway Co.

Operation / Order / Job 20781 Dept. KA.
Subject No. Date 4/5/04 19

Authority is asked for the expenditure of $ 150.53 for the work herein specified, and I recommend it to be granted upon the following terms and conditions.

For the Complete overhauling of Car & Truck also the Painting & Varnishing of Car 135. As per Estimate for Rolling Stock year 1904 - (Master Car 141)

This does not include Truck up & Varnish 9 Mo. Hence

ESTIMATED COST.	$		FINISHED COST.		
Mat. to be purchased	Labor	60.45	Labor	Difference	
Material on hand	Material	90.08	Material	"	
Total	Total Cost	150.53	Total Cost	"	

Approved: John H. Crawford Approved: H A Johnson

Above work charged to Chief.

Approved: DEO Vice Pres. and Gen. Mgr.

3/15/04

FILE. Notes:—

FORM NO. 146, USED AS AUTHORITY FOR REPAIR WORK

he can know what leeway the repair shops have and what orders can be closed down if necessary.

Daily reports of the operation of the power station are submitted in the same manner by the chief engineer on the form of power station log, reproduced on page 902. The information given on this log is self-explanatory.

As stated in the previous article, the repair men are paid a bonus, amounting to 20 per cent of the saving, in case the labor cost is less than the estimate, and stand a loss up to 20 per cent of the estimated labor cost in case the job costs more than that specified.

In 1904 the construction carried on at the "K. A." shops was estimated originally at $16,007; the cost of completing this work was $15,200. Of this amount, $55 was over the estimate and $861 was under the estimate. The repairs planned for 1904 were estimated at $16,766. On Nov. 1 it was considered desirable to make retrenchments, and all work of this character was closed out at that time, making the amount of finished work completed during the year $10,322. The total excesses of the cost of the completed work over the estimates was $889, and that under the estimates $4,099, leaving $3,244 of the total amount uncompleted.

The amount of work done at the "K. A." shops during 1904 amounted to about 20 per cent of the total repair shop work done, and its cost was 0.31 cent per car-mile. The cost of general repairs at the main repair shops of the company was 1.24 cents per car-mile, making a total of 1.55 cents per car-mile.

THE PREPARATION OF THE BUDGET

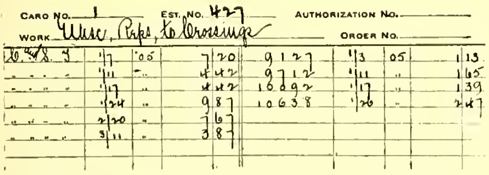
This method of conducting repair shop accounts greatly simplifies the work of preparing the budgets for the coming year, a matter to which the company has given a great deal of attention. The practice in Camden has been to take this work up during the last two months of the previous year and to divide the estimate into two divisions, that relating to earnings and operating expenses and that covering the construction which is required, upon which, of course, the figures in the estimate of earnings and expenses are to some degree dependent. The budget is prepared from the estimates of the heads of the departments as to the improvements in track or equipment required to secure a given ratio of expenses to receipts, say, 60 per cent. After being approved by the general manager and the finance committee, the budget, with the reasons for the expenditure, is mimeographed on typewriter sheets. The sheets are then indexed and bound together, and one complete copy is given to each head of a department. A typical entry appears as follows:

The joints on State Street from Cooper's Creek to River Road are loose and require attention. If these are repaired in the immediate future, it will mean a considerable saving, as it would stop the hammering on receiving rail and thus prolong the life of the rail.

145 joints at $1.00 each.

Req. No. $145.00
Account........ Charge........ Number........
Closed into............................account.
To be distributed.......................................
Date of completion of work ....
Date of report of work filed with auditor ....
Cost as per report ....
Total cost of operation, auditor's final cost......................

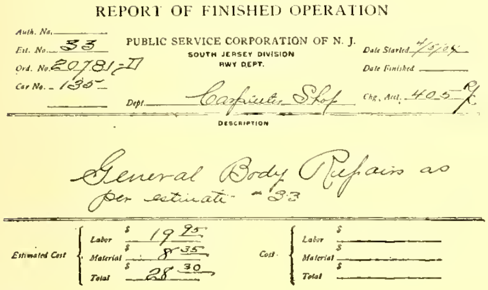
Each page is devoted to a separate job and each page contains the spaces indicated above, in which the requisition number and other data can be entered when the work is ordered. The other figures are inserted as soon as possible; thus the lines "Closed into...... account" and "To be distributed" (indicating the way the job was financed) are filled in when the work is completed, together with the "Cost as per report" and the "Total cost of operation," according to the auditor's final estimate.



CARD No. 1 EST. No. 427 AUTHORIZATION No.
WORK Misc. Reps. to Crossings ORDER No.

D. & S. I	1/7	'05	720	9127	1/3	05	1 13
"	1/11	"	442	9712	1/11	"	1 65
"	1/17	"	442	10092	1/17	"	1 39
"	1/24	"	987	10638	1/26	"	2 47
"	2/20	"	767				
"	3/11	"	387				

CARD FOR TABULATING DAILY COST OF MATERIAL



REPORT OF FINISHED OPERATION

Auth. No.
Est. No. 33
Ord. No. 20781-II
Car No. 135

PUBLIC SERVICE CORPORATION OF N. J.
SOUTH JERSEY DIVISION
RWY DEPT.

Date Started 4/5/04
Date Finished
Dept. Carpenter Shop Chg. Acct. 405 R

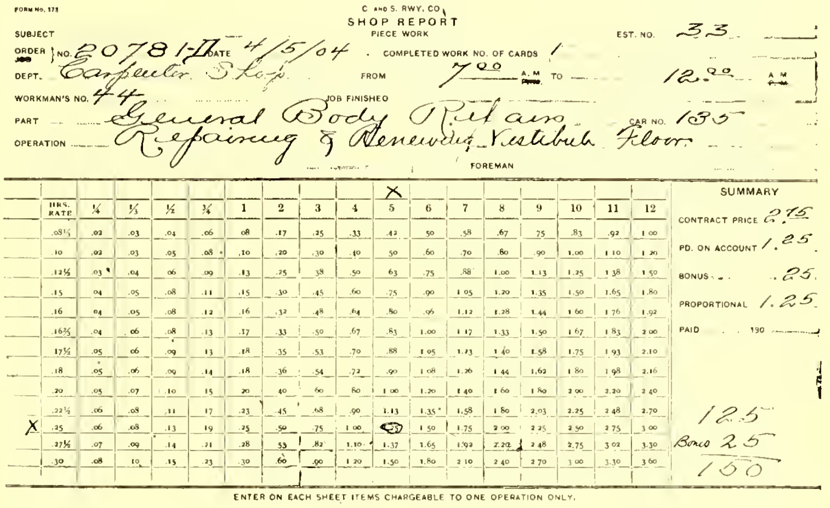
DESCRIPTION

General Body Repairs as per estimate #33

Estimated Cost: Labor $19.25, Material $8.35, Total $28.30
Cost: Labor $, Material $, Total $

Form 84.

REPORT OF COST OF FINISHED OPERATION



FORM No. 173
C. AND S. RWY. CO.
SHOP REPORT
PIECE WORK

SUBJECT EST. NO. 33
ORDER NO. 20781-II DATE 4/5/04 COMPLETED WORK NO. OF CARDS 1
DEPT. Carpenter Shop FROM 7.00 A.M. TO 12.00 A.M.
WORKMAN'S NO. 44 JOB FINISHED
PART General Body Repairs CAR NO. 135
OPERATION Repairing & Renewing Vestibule Floor
FOREMAN

	HRS. RATE	¼	⅓	½	¾	1	2	3	4	5 X	6	7	8	9	10	11	12
	.08⅓	.02	.03	.04	.06	.08	.17	.25	.33	.42	.50	.58	.67	.75	.83	.92	1.00
	.10	.02	.03	.05	.08	.10	.20	.30	.40	.50	.60	.70	.80	.90	1.00	1.10	1.20
	.12½	.03	.04	.06	.09	.13	.25	.38	.50	.63	.75	.88	1.00	1.13	1.25	1.38	1.50
	.15	.04	.05	.08	.11	.15	.30	.45	.60	.75	.90	1.05	1.20	1.35	1.50	1.65	1.80
	.16	.04	.05	.08	.12	.16	.32	.48	.64	.80	.96	1.12	1.28	1.44	1.60	1.76	1.92
	.16⅔	.04	.06	.08	.13	.17	.33	.50	.67	.83	1.00	1.17	1.33	1.50	1.67	1.83	2.00
	.17½	.05	.06	.09	.13	.18	.35	.53	.70	.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10
	.18	.05	.06	.09	.14	.18	.36	.54	.72	.90	1.08	1.26	1.44	1.62	1.80	1.98	2.16
	.20	.05	.07	.10	.15	.20	.40	.60	.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40
	.22½	.06	.08	.11	.17	.23	.45	.68	.90	1.13	1.35	1.58	1.80	2.03	2.25	2.48	2.70
X	.25	.06	.08	.13	.19	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
	.27½	.07	.09	.14	.21	.28	.55	.82	1.10	1.37	1.65	1.92	2.20	2.48	2.75	3.02	3.30
	.30	.08	.10	.15	.23	.30	.60	.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.30	3.60

SUMMARY
CONTRACT PRICE 2.75
PD. ON ACCOUNT 1.25
BONUS .25
PROPORTIONAL 1.25
PAID 190

1.25
Bonus .25
1.50

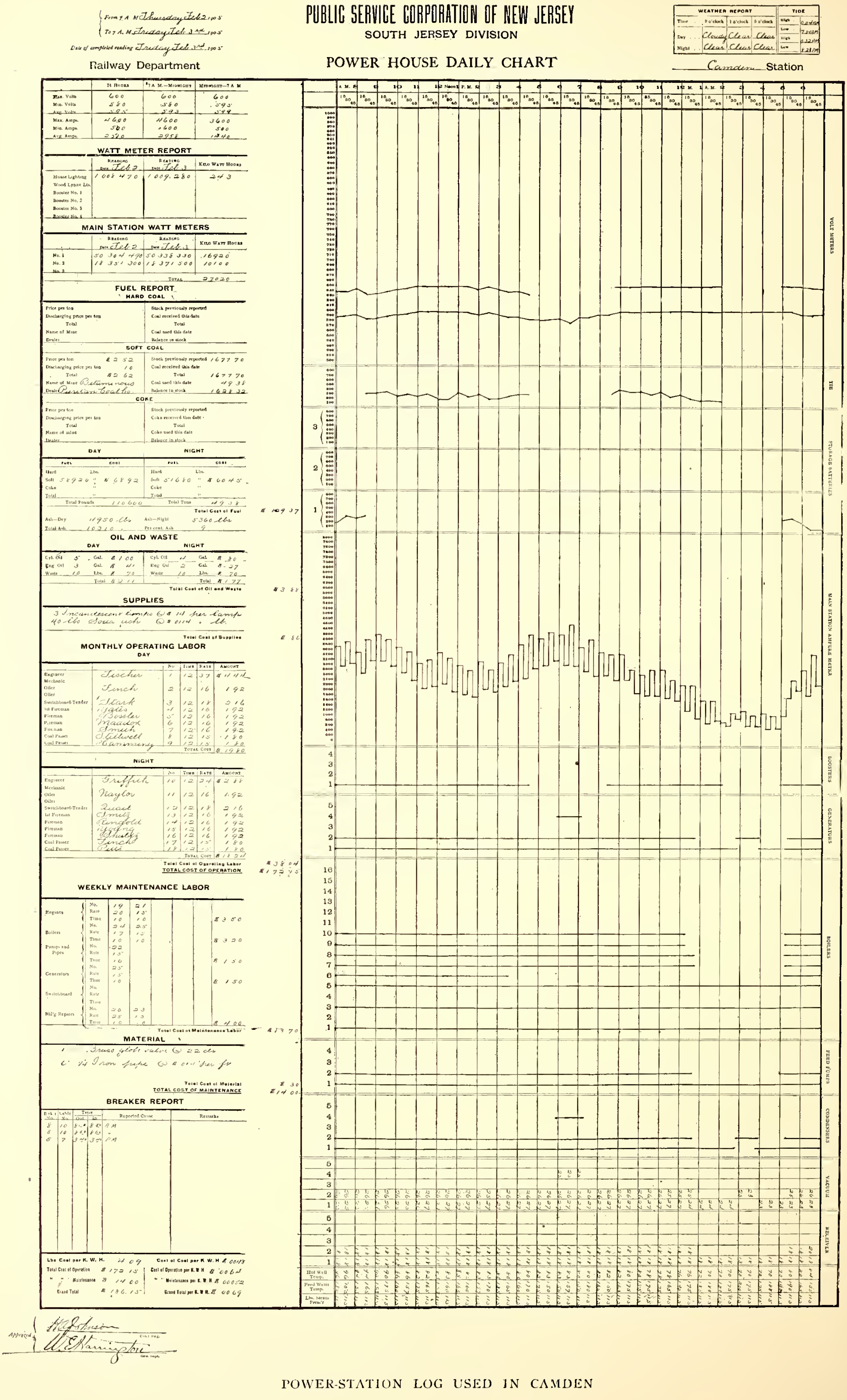
ENTER ON EACH SHEET ITEMS CHARGEABLE TO ONE OPERATION ONLY.

TABULATION OF LABOR COST

The annual estimate of receipts and expenses is prepared in the same form and with the same detail as the construction budget. The first step is to determine by months the car mileage for the coming year. To do this the service and passengers carried on the different divisions during corresponding months are studied from a series of charts for typical and special days, which is maintained for the purpose of regulating the schedules by the superintendent. Charts of this kind are prepared for each division as often as once a month, and sometimes more frequently, and are made up from the conductors' day cards. They show graphically in black ink the number of passengers on regular cars, and in red ink those carried on tripper cars. Where two fares are collected, the fares in each case are indicated in different colored inks. A memorandum also shows the headway, car mileage per division and other features. From these charts and a knowledge of the local conditions, a rough approximation of the number of car-miles and car-hours necessary for the service on each division during the coming year can be obtained. An effort is made to secure average earnings of at least $2 a car-hour from each division.

The next step is for the head of each department to report whether any economies are possible in his department with this car mileage. This cost of operation is, of course, very carefully studied in connection with the construction account authorized, because if the head of a department knows that he is getting new equipment he can cut down repair charges. The power station estimate as regards details is taken up in the same way, the station expenses being divided into labor, fuel, water and oil and waste of each month, and station maintenance into eight different accounts. Before closing the estimate of each department a detail report for each item of the standard system of accounting is required.

Mimeograph copies of each of these estimates of operating expenses are placed in the hands of each head of department, as in the case of the construction budgets. This practice has proved invaluable as an incentive to the high maintenance of efficiency of the different departments; for instance, if the master mechanic sees that he is going ahead of his estimate during any month, he will be apt to economize and turn back into the stock room material which had been charged against him, so as to get credit for it, or hunt up scrap for sale. If the superintendent sees that a man can be cut out he goes to the general manager and recommends that the force be reduced in this way. As a rule, it is often difficult to get the foremen in the different departments to take an interest in petty economies, but with this incentive constantly before them and with the knowledge that each item of expense is being watched and



From 7 A. M. Thursday Feb 2 1905
To 7 A. M. Friday Feb 3rd 1905
Date of completed reading Friday Feb 3rd 1905

Railway Department

PUBLIC SERVICE CORPORATION OF NEW JERSEY
SOUTH JERSEY DIVISION

POWER HOUSE DAILY CHART

Weather Report	7 o'clock	1 o'clock	5 o'clock
Day	Cloudy	Clear	Clear
Night	Clear	Clear	Clear

Camden Station

	24 Hours	7 A. M.—Midnight	Midnight—7 A. M.
Max. Volts	600	600	600
Min. Volts	580	580	595
Avg. Volts	595	593	599
Max. Amps.	4600	4600	3600
Min. Amps.	500	1600	500
Avg. Amps.	2570	2958	1840

WATT METER REPORT

	Reading Date Feb 2	Reading Date Feb 3	Kilo Watt Hours
House Lighting	1 008 470	1 009.280	243
Wood Lynne Lts.			
Booster No. 1			
Booster No. 2			
Booster No. 3			
Booster No. 4			

MAIN STATION WATT METERS

	Reading Date Feb 2	Reading Date Feb 3	Kilo Watt Hours
No. 1	50 304 490	50 338 330	16920
No. 2	18 351 300	18 371 500	10100
No. 3			
		Total	27020

FUEL REPORT

HARD COAL

Price per ton / Discharging price per ton / Total / Name of Mine / Dealer — Stock previously reported / Coal received this date / Total / Coal used this date / Balance in stock

SOFT COAL

Price per ton	$2 52	Stock previously reported	1677 70
Discharging price per ton	10	Coal received this date	
Total	$2 62	Total	1677 70
Name of Mine	Bituminous	Coal used this date	49 38
Dealer	Puritan Coal Co.	Balance in stock	1628 32

COKE

Price per ton / Discharging price per ton / Total / Name of mine / Dealer — Stock previously reported / Coke received this date / Total / Coke used this date / Balance in stock

Day Fuel	Day Cost	Night Fuel	Night Cost
Hard Lbs.		Hard Lbs.	
Soft 58920 "	$68 92	Soft 51680 "	$60 45
Coke "		Coke "	
Total "		Total "	
Total Pounds 110600		Total Tons 49 38	

Total Cost of Fuel $129 37

Ash—Day 4950 lbs. Ash—Night 5360 lbs.
Total Ash 10310 Per cent. Ash 9

OIL AND WASTE

Day			Night		
Cyl. Oil	5 Gal.	$1 00	Cyl. Oil	4 Gal.	$ 80
Eng. Oil	3 Gal.	$ 41	Eng. Oil	2 Gal.	$ 27
Waste	10 Lbs.	$ 70	Waste	10 Lbs.	$ 70
	Total	$2 11		Total	$1 77

Total Cost of Oil and Waste $3 88

SUPPLIES

3 Incandescent lamps @ $ 14 per lamp
40 lbs Soda ash @ $ 0114 lb.

Total Cost of Supplies $ 86

MONTHLY OPERATING LABOR

DAY

		No.	Time	Rate	Amount
Engineer	Fischer	1	12	37	$4 44
Mechanic					
Oiler	Finch	2	12	16	1 92
Oiler					
Switchboard-Tender	Stark	3	12	18	2 16
1st Fireman	Yates	4	12	16	1 92
Fireman	Bossler	5	12	16	1 92
Fireman	Maddox	6	12	16	1 92
Fireman	Smith	7	12	16	1 92
Coal Passer	Stilwell	8	12	15	1 80
Coal Passer	Hammery	9	12	15	1 80
				Total Cost	$19 80

NIGHT

		No.	Time	Rate	Amount
Engineer	Griffith	10	12	24	$2 88
Mechanic					
Oiler	Naylor	11	12	16	1.92
Oiler					
Switchboard-Tender	Quast	12	12	18	2 16
1st Fireman	Smitz	13	12	16	1 92
Fireman	Ringold	14	12	16	1 92
Fireman	Young	15	12	16	1 92
Fireman	Shultz	16	12	16	1 92
Coal Passer	Finch	17	12	15	1 80
Coal Passer	Pitts	18	12	15	1 80
				Total Cost	$18 24

Total Cost of Operating Labor $38 04
TOTAL COST OF OPERATION $172 15

WEEKLY MAINTENANCE LABOR

Engines	No.	19	21	
	Rate	20	15	
	Time	10	10	$3 50
Boilers	No.	24	25	
	Rate	17	15	
	Time	10	10	$3 20
Pumps and Pipes	No.	22		
	Rate	15		
	Time	10		$1 50
Generators	No.	25		
	Rate	15		
	Time	10		$1 50
Switchboard	No.			
	Rate			
	Time			
Bld'g Repairs	No.	20	23	
	Rate	25	15	
	Time	10	10	$4 00

Total Cost of Maintenance Labor $13 70

MATERIAL

1 Brass globe valve @ 22 cts
6' 1¼ Iron pipe @ $ 014 per ft

Total Cost of Material $ 30
TOTAL COST OF MAINTENANCE $14 00

BREAKER REPORT

Brk'r No.	Cable No.	Time Out	Time In	Reported Cause	Remarks
8	10	8:40	8:50	A M	
8	10	8:49	8:50	"	
6	7	3:40	3:50	P M	

Lbs. Coal per K. W. H.	4 09	Cost of Coal per K. W. H.	$ 00478
Total Cost of Operation	$172 15	Cost of Operation per K. W. H.	$ 0064
" " Maintenance	$ 14 00	" " Maintenance per K. W. H.	$ 00052
Grand Total	$186.15	Grand Total per K. W. H.	$ 0069

VOLT METERS / TIE / STORAGE BATTERIES / MAIN STATION AMPERE METER / BOOSTERS / GENERATORS / BOILERS / FEED PUMPS / CONDENSERS / VACUUM / RECEIVER

Hot Well Temp. / Feed Water Temp. / Lbs. Steam Press're

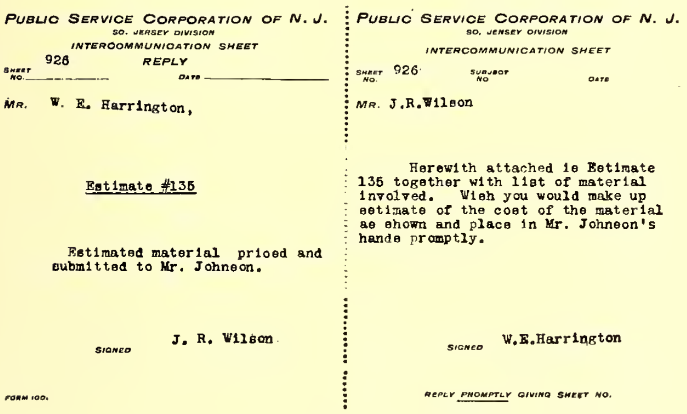
Approved H. J. Johnson, Chief Eng.
W. E. Harrington, Gen. Supt.

POWER-STATION LOG USED IN CAMDEN

charged up to his department, each foreman not only takes an interest in looking out for small details, but prepares the plans for reducing expenses.

One objection often raised against a budget is that it is too slavishly followed—that is, that if the cost of operation in any department proves to be less than the original estimate, the head of the department will make no great attempt to reduce them, and that he is more interested in proving that his calculations as recorded in the budget are correct than in giving good service. Another objection often raised against too elaborate a budget is that if the final figures do prove materially different from those estimated, the head of the department feels called upon to spend a considerable time explaining the reasons therefor. These objections might be raised in case too great adherence was given to the correctness of the estimates, but there can be no doubt that the practice in Camden has shown that if a broad view is taken of the situation there is no trouble of the kind mentioned, but the plan acts as an incentive to create interest in the economical operation of the road.

On the Camden system there is still a third budget sheet prepared, entitled "repairs." Under this name are placed such proposed repairs as are not absolutely necessary, but which can be carried out in case the directors of the company consider the situation warrants them. These items are indexed and given in


PUBLIC SERVICE CORPORATION OF N. J.
SO. JERSEY DIVISION
INTERCOMMUNICATION SHEET
REPLY
SHEET NO. 926 DATE
MR. W. E. Harrington,

Estimate #135

Estimated material priced and submitted to Mr. Johnson.

SIGNED J. R. Wilson

FORM 100.

PUBLIC SERVICE CORPORATION OF N. J.
SO. JERSEY DIVISION
INTERCOMMUNICATION SHEET
SHEET NO. 926 SUBJECT NO. DATE
MR. J.R.Wilson

Herewith attached is Estimate 135 together with list of material involved. Wish you would make up estimate of the cost of the material as shown and place in Mr. Johnson's hands promptly.

SIGNED W.E.Harrington

REPLY PROMPTLY GIVING SHEET NO.

FORM 100, USED FOR DEPARTMENTAL COMMUNICATIONS

detail in the same way as that of the approved items described before—that is, the spaces for requisition number, account and final figures are left on each sheet, to be filled in only if the construction is approved. This book forms a leeway for additional expenditure in case there should be an unexpected economy in any department, and affords an opportunity of overcoming a too strict adherence to the original estimates already mentioned, because each head of department would take pride in contributing his proportion to the amount required to carry out any of these special repairs.

REPORTS FROM FOREMEN

It will be of interest in this connection to refer to the method employed in Camden of issuing instructions to the heads of the different departments and in communications between departments. All communications of this kind from the general manager are typewritten on the form illustrated herewith, which is a sheet perforated vertically through the center. The portion to the left is used for the letter and that to the right for the answer. A carbon copy is made of the original letter and is filed in an "unanswered" file, under the name of the foreman.

When the letter is received by the foreman, he detaches the original for preservation and replies on the half intended for the answer. When his answer is received at the general manager's office, the stenographer pins the reply to the carbon of the original letter on the general manager's desk. If unsatisfactory, the papers are filed together for such further action as may be necessary; if the reply is satisfactory, the papers are filed under the subject to which they pertain. The company has found that this system is much more desirable than the occasional use of notes and occasional verbal inquiries or instructions. It takes no longer to dictate a note of this kind than it does to mention the subject; even during a conversation with the head of any department, the manager often turns to the stenographer and dictates a note of this kind when the subject demands it. As the unanswered inquiries are always in a separate file, the manager can at any time look over them and send a follow-up letter, referring to the original inquiry by its proper serial number. There are so many subjects that it would be impossible to remember them all, as would be necessary with verbal instructions. The method also settles matters promptly, and in actual practice it is even more simple to carry out than describe. In fact, the office work of the general manager in looking over the reports, forms, etc., which are described in this and previous articles on the Camden system, does not take three-quarters of an hour a day.

CHANGE IN THE PERSONNEL OF THE MEXICO CITY ELECTRIC RAILWAY

Several changes in the operation of the Mexico City Electric Railway, of Mexico City, Mex., have already been made by General Superintendent J. A. Peirce, with the approval of General Manager W. W. Wheatly. Among the most important of these changes is the consolidation of the first and second divisions into one division, which is known as Division No. 1, under the management of William H. Bellamy, the former superintendent of the first division. The headquarters of Division No. 1 are at the kiosko, in the Zocalo, from which point the two former divisions, Nos. 1 and 2, were directed. John H. Gaffney, former superintendent of the second division, has been transferred to the management of Division No. 3, formerly Division No. 4, taking the place of Charles H. Nelson, who resigned a few days ago and returned to his home in the United States. Former Division No. 3, in charge of Charles E. Howard, will in the future be known as Division No. 2, and Mr. Howard will continue to act as its superintendent. In addition to these changes, the positions of supervisor of motormen and supervisor of conductors have been consolidated into one office and placed in charge of the chief despatcher's department, which appoints a supervisor for the motormen and conductors. Albert Curtis, who formerly occupied the position of supervisor of motormen, has been appointed assistant to Mr. Bellamy, the superintendent of the first division.

CONNECTICUT-MASSACHUSETTS EXCURSION TRIPS

The Hartford & Springfield Street Railway Company, operating between Hartford, Conn., and Springfield, Mass., has perfected plans for running cars with reserved seats to numerous points of interest in and about Springfield and Hartford, each of which will be a starting point. It is the intention of the company to sell reserved seats on special cars which will leave Springfield on Saturdays and Sundays for half-day and all-day tours. Delightful Saturday afternoon excursions are contemplated to the historical old Elm Tree Inn in Farmington, Conn., where a remnant of the old-time hospitality of the colonial period still remains and a dinner to suit the epicurean can be had. Fishing tours to beautiful Crystal Lake in the Comers Mountains, where the real fish still exist and can be caught, are also contemplated. The latter is the most picturesque of the trips to be offered, either from Hartford or Springfield, and will embrace, besides the trolley ride, a tour by stage through the chain of mountains of which Bald and Soapstone are the principal peaks, and a sojourn at Bowler's Hotel at Crystal Lake. Lake Compounce and Laurel Park are other places to which special excursions will be run.

NEW DESTINATION SIGNS AT ST. LOUIS

The United Railways Company, of St. Louis, having had considerable trouble from the illegibility of some of its older destination signs on cars, is equipping with a new sign, which, it is believed, will be plainly legible both by night and day under

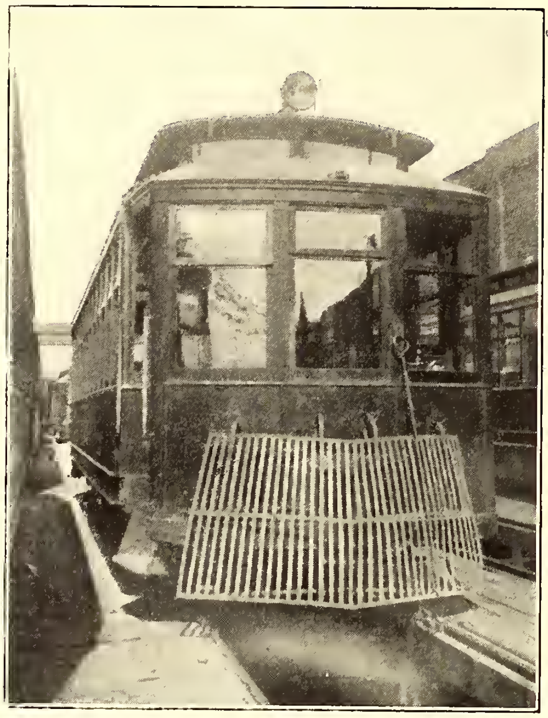


FIG. 1.—FRONT VIEW OF CAR, SHOWING LOCATION OF NEW DESTINATION SIGN

FIG. 4.—PERFORATED LETTER BOARD, ST. LOUIS CAR SIGNS

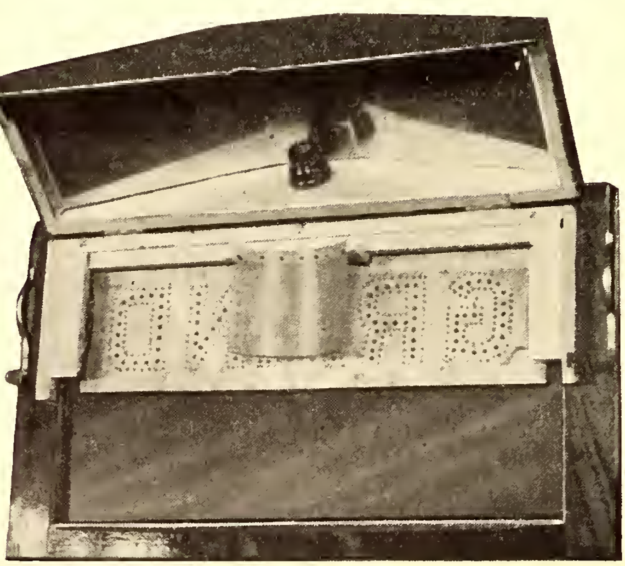


FIG. 2.—ST LOUIS DESTINATION SIGN, FROM REAR

all conditions. The old sign was of a type employed by many companies, consisting of a board through which the letters are cut. They are then backed with white celluloid or other translucent material, and the sign is mounted so that the light in the front of the deck will shine through it at night. When these signs became old they were almost illegible at some angles, both by night and day, and passengers would be obliged in many cases to stop cars which they did not want, because they could not read the sign on an approaching car until the car was very close.

The new sign is installed in the top of the right-hand vestibule window, as shown in Fig. 1, being fastened directly to the window sash, so that taking out the sash also takes out the

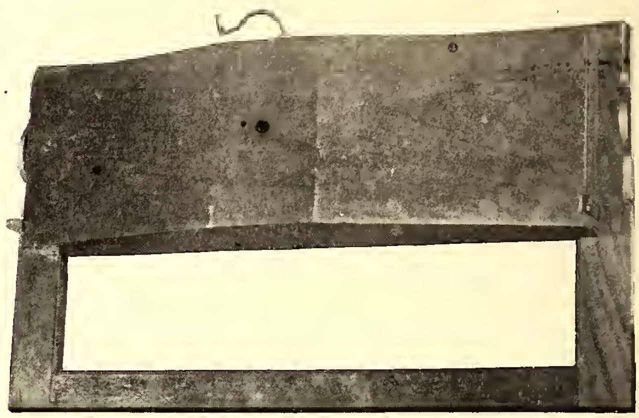


FIG. 3.—SIGN FROM REAR, CLOSED

entire sign. Fig. 2 is a rear view of the sign, showing it fastened to the sash as it would appear from the inside of the car. Fig. 3 is a view from the rear as in Fig. 2, but in Fig. 3 the sign is opened so that the letter board can be removed. Fig. 3 shows the arrangement of the sign. The letter board, which is

FIG. 5.—ENAMELED IRON DESTINATION SIGN OVER REAR PLATFORM, ST. LOUIS

shown removed in Fig. 4, is of sheet iron with perforations through which the light shines at night to bring out the letters. There is but one incandescent lamp in the sign. Back of the lamp the box is lined with bright tin, which acts as a reflector. A screen of perforated metal is placed immediately in front of the lamp so that the center of the sign will not be too light in proportion to the ends, and thus detract from the general legibility and appearance of the sign. The receptacle for the incandescent lamp is mounted on the hinged back of the sign, as seen in Fig. 3, and therefore is connected to the car lighting circuit by a short piece of flexible cord.

Another decided improvement in the way of signs which has been adopted by this company is to hang a second destination sign directly over the rear entrance, as seen in Fig. 5. The cars are long, and it frequently happens in the downtown district that people come up to a car after it has stopped without having seen the destination sign at the front end, and are obliged to stop and ask the conductor the destination of the car before boarding, all of which is likely to cause delay. This sign over the rear platform does away with this trouble.

PROCEEDINGS OF THE INTERNATIONAL RAILWAY CONGRESS—II

In the last issue of the Street Railway Journal a report was published of the early meetings of the different sections of the International Railway Congress. From figures compiled by the general secretary of the Congress, L. Weissenbruch, it developed that the number of countries represented by delegates was 46; the number of railroads represented was 404, and that the total number of delegates was 568, of whom 286 were foreign and 282 American. The length of railways represented was 310,940 miles, or 500,400 km.

TRACK CONSTRUCTION

Following the meeting on May 8 of Section I., mentioned in the last issue, the subject of cross-ties was taken up and the relative merits of karri and jarrah, both Australian woods, were first considered. These woods are used not only extensively in Australasia, but also in Europe.

Mr. Lum (Southern Railway, United States) stated that in his section of country white oak is used in preference to any other wood. Some experiments have also been made on a limited scale with cross-ties of red oak or black oak, and others of long leaf yellow pine. Mr. Lum also gave some information regarding the life of ties of each of these varieties; under some climatic conditions yellow pine last only two years.

The conclusions adopted by the section as a result of this discussion were as follows:

1. The pickling of sleepers in order to lengthen their lives is to be generally recommended; the selection of the antiseptic and the method of performing the pickling operations depend on individual conditions.

2. Creosote seems to be the best preservative of sleepers; it has been successfully tried for a longer time than any other antiseptic, and the results have proved that a creosoted cross-tie will last in main line service many times as long as an untreated cross-tie.

3. Either hard or soft woods may be used, the selection depending on local conditions.

4. Specifications must be exact, and great care should be exercised by the inspector before accepting cross-ties for treatment. When accepted the sleepers should be piled at least 6 ins. above the ground in open stacks in such a manner as to allow free access of air and light. The grounds surrounding the piles of sleepers should be kept clean and free from decaying matter.

5. The uncovering of the ties by removing the ballast from the top surface does not appear to diminish the life of the wood even for untreated timber, and it has the advantage of enabling the track inspector to discover at once any defects in the track fastenings, etc., and to apply a remedy. In some special cases, and especially in warmer countries, it may be useful to cover the timber with ballast.

6. It is of importance to combine rigid inspection in accepting ties with great care in the selection of ballast; the latter must be permeable, must be capable of being well packed, and the packing well maintained, and give good adhesion between the ties and its seat. As far as this is concerned the measures which are best for the preservation of the wood are also best for the stiffness of the track.

7. In order to prevent deterioration of the ballast, and at the same time help to preserve the sleepers, the careful drainage of the roadbed cannot be too carefully insisted upon in order to insure that water may run off properly.

8. To prevent mechanical wear of the rails upon the ties, it is of the greatest importance to fasten the rail to the tie in such a manner as to prevent as much as possible all vertical, lateral and horizontal movement between the two. The old American method of using only spikes will not accomplish this. Lag screws seem to be necessary to attain satisfactory results.

9. It is only by keeping careful and accurate record of the number of ties treated, the manner in which they were treated, and where and when they were placed in the track, together with a record of when they were taken out of the track, that it is possible to determine whether any one particular treatment is giving satisfaction and is a good investment. Every railroad management using treated ties is urged to have them all marked, preferably with dating nails, and that a careful system of records should be instituted at the earliest possible time.

The subject of track construction for heavy traffic was then considered and resulted in some discussion on the relative merits of opposite vs. broken joints. The American practice seems to be in favor of the latter method, while the European roads prefer the former. Mr. Cartault, of the Paris-Lyons-Mediterranean Railroad, explained that European roads are laid on fewer ties than American roads, that the ties are placed closer together near the joints to insure even riding, and that the use of broken joints interferes with this practice. The section decided not to adopt any general recommendation in regard to this point.

The next subject discussed was the use of extra long rails, and it developed that the Paris-Lyons-Mediterranean Railroad has 300 km (188 miles) of track equipped with 18-m (59-ft.) rails, and a certain amount of track with 24-m (79-ft.) rails. These rails cost no more and their transportation and handling do not present any difficulties. There was also no more tendency in these rails to break than shorter rails. A number of the English roads have also experimented with 45-ft. and even with 60-ft. rails. On American roads the 33-ft. rail remains the standard.

At the general meeting on May 11, when the conclusions of Section I. on preservation of ties (reported above) were submitted, they were adopted.

Following this action, the association took up the subject of the deterioration of ties in tropical countries and means for preventing such deterioration. Upon proposal by Mr. Vianna (Portuguese State Railways), and after some remarks by Messrs. Heurteau and Von Leber (members of the permanent commission), the association decided that the data on this subject were too meager to give precise conclusions, and that it was desirable that this subject remain on the programme of the next meeting.

SUBURBAN TRAFFIC

A general meeting of the association was also held with Section III. to consider Question XII., "arrangements for suburban traffic," on which papers were presented by A. W. Sullivan, general manager of the Missouri Pacific Railway, and H. G. Drury, superintendent of the Great Eastern Railroad, London. The meeting discussed the conclusions published in the last issue, and after some remarks from Messrs. Cartault (Paris-Lyons-Mediterranean Railway), Mange (Orleans Railway, France) and Von Leber (Austrian Government Railway), suggesting the omission after the words "the space between tracks," the following words: "The curves should then be compensated to provide the same clearances as upon tangents." Mr. Cartault remarked particularly that these words are unnecessary, because the radii of the curves depend on the length and style of construction of the cars.

With this omission, the conclusions published last week were adopted.

HOURS FOR EMPLOYEES

In Section IV., the following conclusions were adopted regarding the length of time on duty and working regulations for railway employees and laborers.

CONCLUSIONS

The congress considers:

That it is impossible to establish uniform rules which are applicable to different special cases because of the many peculiarities of railroad service.

That the rules to be applied should vary not only with the various classes of employees, but also for each class with the greater or less exacting character of work done, which render it necessary to give them sufficient elasticity to make them adaptable to all possible cases.

That, due to these conditions, it is impossible to reconcile the rigidity of the law with the elasticity necessitated by the various arrangements required to meet the needs of the public, the employees and the employing management.

It is held that it is desirable that the employer should have the greatest latitude to fix, under the control of competent authorities, the regulations of work.

1. To fully take into account the importance of the work to be done, the continuity and intensity of the labor required in order to fix the number of working hours to be required from the employees of any class.

2. To compute the number of hours according to an average, established through a sufficiently long period, which has been divided into periods of work, separated by suitable rest.

3. To proportion the average duration of work to the nature of the labor and to the degree of responsibility required.

INDEPENDENT MOTOR CARS

On May 11 Sections III. and V., meeting conjointly, considered the question of motor cars, in regard to which some interesting particulars of some foreign motor cars were presented by Joseph Rocca, chief inspector of the Mediterranean Railway of Italy. He stated, for instance, that on the Wurtemberg State Railways there were in operation in 1903 five petroleum cars of the Daimler system, seven steam cars of the Serpollet system and one electric accumulator car. The average run of these cars was 31,717 km. The expense per 100 km was given in centimes as:

FOR THE DAIMLER CAR		FOR THE SERPOLLET CAR	
Fuel	12.06 centimes	Fuel	5.90 centimes
Lubrication	0.60 centimes	Lubrication	0.56 centimes
Maintenance	4.64 centimes	Maintenance	8.91 centimes
Total	17.30 centimes	Total	15.37 centimes

These results, and those obtained on different Hungarian railways, lead to the hope that auto-motor cars will be the means of increasing the number of passenger trains without any considerable increase in cost. Still, the technical solution of the problem of these cars does not seem as yet to have been sufficiently perfected.

Mr. de Tolnay, general superintendent of the Hungarian State Railways, held that the question is not one that can be precisely answered. He therefore felt that no absolute conclusions should be proposed.

Joseph Rostern, assistant general manager of the Great Central Railway, London, said that his company has in operation two motor cars similar to those on the Great Western, with accommodations for sixty first-class and third-class passengers and a small amount of baggage. He inquired whether there are any other companies, either in England or in other countries, which are using auto-motor cars on lines with heavy grades.

The president observed that the question of grades is of comparatively minor importance, and that this difficulty may be overcome by increasing the power of cars. He stated that in Austria electric traction provides for climbing grades of as high as 11 per cent and 11½ per cent; that in California there are grades reaching 14 per cent, and at Montreux, on Lake Geneva, a tramway ascends, without gearing, but with special safety appliances, a 15 per cent grade.

Alexander Sopkéz (Hungary) remarked that the question of grades differs greatly, according to whether it relates to electric traction by trolley or third rail or self-propelled automobiles; with electric cars almost the limit of adhesive power can be obtained.

Mr. Jenny (Austria) stated that it was not merely a question of the adhesion of vehicles, but that the coefficient of adhesion itself, according to experiments made in Austria, is much higher with electric traction, owing to the magnetizing of the tracks by the return current.

The president fully agreed with Mr. Sopkéz regarding the greater adhesion of electric vehicles, which is due in a measure to the elaborate driving motors with which they are equipped. He reported experiments recently made in Vienna, with the object of better utilizing the entire adhesion. As for the question of the magnetization of the rail, he thought that the experiments made up to now have not been sufficiently conclusive.

Mr. Jenny explained that he had been present at experiments demonstrating this point.

The discussion then turned to the question of the steepest grades which can be overcome by ordinary trains.

Some instances were cited by Mr. Ramsey (Chicago, Peoria & St. Louis Railroad) among the mountains of the West, and by Robert Trimble (Pennsylvania Railroad) among Colorado lines, where ordinary trains run on 2.7 per cent, 4 per cent and even 5 per cent grades. Grades of 2½ per cent to 3 per cent are generally admissible for ordinary trains.

Mr. Wilson (assistant general manager Northeastern Railway) stated that the greatest difficulties encountered in England by light railways have been the higher cost of construction and the requirements imposed on the operating companies, especially as to signal systems. The traffic has in several cases proved insufficient to pay fixed charges and cost of operation, and it has become necessary to replace the railroads with an automobile service on highways. As to the question of reducing the station service, excellent results have been obtained by utilizing lower salaried employees, doing without individual station accounts and entrusting the central accounting department with the work of the whole line. Finally, the English companies have suffered because of the requirements of the public in matters of safety. A plan for electrifying a line by means of a third rail had to be abandoned because of complaints of the public, who claimed that grade crossings were too dangerous for the passage of cattle and the general traffic of the highway. The difficulty was met by arranging a car with a motor so that it was capable of running in either direction without turning.

Mr. de Tolnay (general manager of the Tramway Construction Company of Liege) expressed the opinion that the public authorities should favor as much as possible simplifications conducive to the operation of light railways, and that this question, because of its great importance, should be placed on the programme of the next meeting of the Congress. The following draft of conclusions was adopted by the joint sections:

CONCLUSIONS

The simplification of the service on lines which carry little traffic has a general interest for all railways operating such lines. The congress expresses the wish that the present tendency of a legislation to establish more liberal regulations for line with little traffic and light trains may become more general, and that the efforts of the managements to equip their light traffic lines with a more economical organization, which promise to give remarkable results, be continued. The simplifications introduced in maintenance of way, stations and trains, as well as the introduction of automotor cars on different lines, merit commendation.

While recognizing that the technical side of the question of automotors, as applied up to the present time, are capable of improvement, the congress expresses the opinion that experiments with this method of transportation should be continued.

It is desirable that this important question should not be lost sight of, and that the international commission should incorporate it in their programme for the next meeting.

Sections IV. and V., meeting together on May 9, also discussed the question of motor cars, and a report on the organization of such a service was presented by F. Sartiaux, of the Northern Railway of France. In this report Mr. Sartiaux compared the leading three systems of motor cars as follows:

Steam cars are generally more powerful and more economical than the others; but they do not start as quickly as petroleum cars and they are heavier. Petroleum cars have the disadvantage of containing delicate mechanism and gearing, causing a serious loss of power; they also have a disagreeable vibration when starting; but it is easier to drive them and the cost of maintenance appears to be lower than that of steam cars. As for storage battery cars, the objection to them is the great amount of dead weight and their limited power.

Mr. Laurent (Paris-Orleans) gave an account of the experience of the Orleans Company with auto-motor cars since 1903, when the first one was put in operation as an experiment. This car was designed with the following object: To replace an existing light train on a light railway with an auto-motor train consisting of one auto-motor car and one or two trailers, capable of developing a speed of 20 km per hour on a 2 per cent grade, and 60 km per hour on level sections. The object of the test was also to ascertain the net cost of such a train, with a view to more extensive application. To make this test it was necessary to have a motor car with a capacity of about 130 hp. It was realized that for this power it would not be advantageous to employ a boiler of the locomotive type, and that to solve the problem a water tube boiler should be used. The preference was given to the Purrey type of boiler, which had been used successfully for some time on street railway lines in Paris. The auto-motor car built and put in operation in 1903 was a car with two axles, weighing about 20 metric tons, which in addition to the boiler located in front, and the motor hung under the floor, included a baggage car with 10 sq. m of floor surface space, a compartment for mails, seats for twenty-six passengers and a platform. This car can draw two third-class trailers with four compartments. It has been running about a year and a half, and although it is not yet possible to give exact figures on the cost per km-train, owing to the many readjustments that have been necessary, the results have been sufficiently satisfactory to induce the Orleans Company to continue the trial on a larger scale.

The company has at present under construction ten auto-motor cars of a similar type, of about 200 hp. These cars will consist of a motor truck carrying the boiler and motor, and a carriage supported in front by the motor truck and by an axle in the rear. The car includes a baggage car of 10 sq. m, two and one-half compartments of the first-class and four of the third; sixty-five seats in all. It can draw at a speed of 60 km per hour on the level run and 40 km on a grade of 2 per cent a passenger car containing ninety seats. It can run alone at a speed of 80 km per hour on a level.

The company has decided to use these ten cars, either to replace existing light traffic trains by auto-motor trains, to furnish new service on the same line, or to establish, on lines with heavy traffic, service which would enable certain stops of local trains to be omitted and thus increase their speed. The auto-motor trains would then be used in some places as collecting trains. These cars will be in operation at the end of the present year.

As interesting technical information, Mr. Laurent reported that the wheels are driven in these cars not by driving rods, but by chains. At the beginning the engineers of the company were somewhat afraid of the working of the chains, but during the whole period of the experiment no difficulties were noticed. The use of chain driving as well as a good balancing of the motor, which is placed under the car between the frames, affords reason for the expectation that there will be no trouble in these cars from vibrations which have sometimes made traveling in auto-motor cars disagreeable to passengers.

It is difficult, he stated, to give as yet the precise results of the experiments of the Orleans Company, but that the latter expects that after the experiments which are being conducted it will be able to estimate the value of this new method.

Mr. Delannoy (Western Railroad of France) reported trials made on his system for ten years past with auto-motor cars with boilers of the locomotive type. The trials have not given satisfactory results because of the numerous repairs required by this kind of machines. The economies realized in the number of employees and in fuel consumption have been more than offset by the extra expenses of maintenance.

Mr. Davis (North-Eastern Railway) supplied interesting information concerning trials with auto-motor cars made on his road. The gross receipts per train-mile were 14.59 pence. The cost of traction was 5.299 pence, and the net receipts 9.20 pence.

Mr. Hoy (Central South Africa Government) said that some experiments there of this kind during the last eighteen years have led to good results. The auto-motor cars are used under the same conditions as those previously described. In South Africa especially there are light railways serving mining districts on which a regular train service would not pay, but where the use of auto-motor cars for passengers has given full satisfaction. It is his opinion that this success can be obtained as well on narrow gage as on standard gage lines.

In reply to a question put by Mr. Kinoshita (Japanese State) regarding the number of seats and the cost of auto-motor cars, Messrs. Davis, Hoy and Laurent gave the following information: On their lines the number of seats to a car is respectively 52, 65 and 65; cost of the cars is approximately £3,500, £3,000 and 35,000 francs.

Mr. Hyde (Great Eastern Railway) and Mr. Clear (Great Central Railway) broached the subject of the use of motor cars on highways, which may aid in increasing passenger traffic. The president, Mr. von Leber, remarked that this method of transportation did not come within the province of Question XX.

Finally, Mr. Pickering (South Australian Government Railways) expressed the opinion that certain sections of the main line of his system, with a length of 1200 miles to 360,000 inhabitants, which passes through a new and sparsely populated country, could not be operated at a profit except with auto-motor cars.

The president, Mr. von Leber, referring to the practically identical views expressed by the speakers in regard to the use of auto-motor cars of carefully selected types as used in special kinds of service, submitted to the sections the following proposed conclusions, the wording of which was taken from the reporter's paper and was unanimously adopted:

PROPOSED CONCLUSIONS

1. Experiments with automobile cars and with automotors hauling trailers have been numerous during the last few years to an important extent, both for use on lines with little traffic and for use on busy lines, and it may be expected that from now on these cars will constitute a valuable means of transportation, which, on some lines, will have a great future.

It does not appear doubtful that, owing to the saving of an employee in the driving, to the material reduction in the cost of traction, to the probable reduction in the cost of maintenance, to a better utilization of the rolling stock, to the smaller extent of station installations required, perhaps also owing to less wear of the rails, automobile and automotor cars will make it possible materially to reduce the cost of working lines with little traffic, and will in the cases of other lines result in a material improvement in the working of some classes of service. Their use will certainly effect a change in the system of operation in the case of a great number of lines, and appears to have a real future before it.

The period of actual operation has, however, only just begun, and definite economic results cannot yet be clearly discerned in favor of a given type of motor, or of a given system of working.

2. It is desirable that railway managements should continue their experiments in this direction, and more especially investigate the classes of service to which this new motor is suitable, and the advantages it offers the public and the railway managements, particularly in the matter of cost.

3. Finally, it is important that any changes recognized, or which may be hereafter recognized, as likely to facilitate the advantageous use of automobile and automotor cars should be introduced into the regulations in force.

ELECTRIC TRACTION

The four papers on electric traction were discussed by Sections II. and V. on the mornings of Thursday and Friday, May 11 and 12. The chairman was Mr. Sauvage. The papers of Messrs. Young, Gerard and Tremontani, published in the last issue, were presented in abstract, as was that of F. Paul-Dubois, which appears on page 911 of this issue. Dr. Schulz, of the Imperial German Government Department, then presented a paper on the results of the Berlin-Zossen tests of 1901, 1902 and 1903. This paper will be found on page 915 of this issue.

J. A. F. Aspinall (Lancashire & Yorkshire Railway) then gave some details on the electric line from Liverpool to Southport. Electric traction was not adopted on this line for the sake of economy, but to increase the receipts. Since the twelve months during which the line has been operated electrically the results are most satisfactory as to increase in traffic, but the operation is more expensive than with steam. The cost of coal per ton-mile especially is greater; the running expenses, however, are less, because of the greater mileage run by the crews. Mr. Aspinall stated that the train staff of express trains (made up of four and sometimes five cars) consists of a motorman and a conductor, who stays during the run in the motorman's compartment; that of local trains consists of a motorman and two conductors. The service is complicated owing to the fact that it has three classes and considerable baggage to transport. The run from Liverpool to Southport takes thirty-seven minutes, including fourteen stops of fifteen seconds each; passengers open and close the doors themselves; the boarding and leaving is done very rapidly owing to the special arrangement of the entrance and exit doors.

One of the reasons for introducing electric traction on the line was the necessity of decreasing the crowding of the Liverpool terminus during the busy hours; the handling of an inbound steam train and its redespatching requires four distinct switching operations and eight signal operations, while for an electric train two switching and four signal operations are sufficient. It has therefore just doubled their terminal capacity. Further, as their terminal facilities for handling traffic on four tracks has increased, they are enabled to do all their passenger work on two tracks, leaving the other two for freight. Since electrification, however, the traffic has increased so much that they are preparing all four tracks for using electricity.

The cost of the electric installations on the Liverpool & Southport line was as high as £20,000 per mile, or about three and one-half times the installation of a steam locomotive service. If the interest and sinking fund charges of this sum are added to the cost of operation, it is not surprising that electric traction costs more than steam. Mr. Aspinall added that the weight of electric equipment of the trains on the Liverpool-Southport line is not less than the weight of corresponding locomotives, and that the same will hold true for trains on main lines.

A discussion then developed between Dr. Schulz and Mr. Gerard on the usefulness of a guard rail with which the road built for the high-speed experiments was provided. Mr. Schulz held that this guard rail is especially important because of the strengthening of the track which it affords, but it did not appear to him necessary for the prevention of derailments. The opinions on this subject were, however, divided, and experience only will enable a decision whether the guard rail is useful or not.

T. H. Laurent, of the Paris-Orleans Railroad, stated that he was in full accord with the conclusions of Mr. Paul-Dubois' report as to the fact that electric traction at the present state offers a successful solution of problems presenting themselves in some particular cases. The Orleans Company has used electric traction in one of these particular cases, as has been described in the above-mentioned report. This was in the case of a line through a tunnel into Paris—that is, a suburban traffic line. This line gives full satisfaction to the company. On the other hand, Mr. Laurent held, with Mr. Gerard, that the very interesting communication by Dr. Schulz touches a completely new and different question, that of high-speed traction on main lines. It can be said that the whole world has followed with the greatest interest the experiments made in Germany, and Mr. Laurent felt obliged to Dr. Schulz for the details furnished on the subject. But, while listening to these details, he was struck by the fact that if the experiments made in Germany are of the highest interest from the technical point of view, the results from them show that the use of very high speeds on railroads will cause enormous expense. It requires, in fact, a special track construction to permit speeds of 200 km per hour; moreover, under this speed new questions of braking and signaling arise. It therefore appears that entirely new and specialized tracks will have to be built for high-speed trains. On the other hand, one is struck by the enormous increase in the consumption of energy required for high speed; thus, not less than 1340 hp are required to maintain a speed of 200 km per hour, on a level stretch, for a single motor car weighing 30 tons and containing fifty seats. The cost of this consumption is enormous if it is remembered that in the high-speed trains of the Orleans Company 1200-hp to 1300-hp engines are sufficient to pull trains containing about 400 first-class passengers at a speed of 100 km to 120 km per hour. The question may then be asked whether, after the technical problem has been solved, the economic problem can also be considered as admitting of solution. Is it possible to conceive that the desire to establish a train service with very high speed should some day justify the enormous expenses of installation which will be required for this purpose? In some publications mention has been made of the intention to establish such a line between Brussels and Antwerp and between Liverpool and Manchester. Mr. Laurent asked whether this was so and whether the question was studied from the economic point of view, including interest on capital. He would be pleased if some of the members present would inform him on this subject.

Mr. Gerard replied, as to the projected electric line between Brussels and Antwerp, the length of which is 44 km, that there is no intention to obtain on this line very high speeds; the object is rather to create an interurban service with very frequent trains and with low fares.

Dr. Schulz stated that, as far as Germany is concerned, the question is being discussed of establishing high-speed electric lines between Berlin and Hamburg. He agreed with Mr. Laurent in thinking that an enterprise of this kind would be very costly, as it would require a completely new line because of the dangers which would result from the difference in speeds of trains running on the same track; it would also be necessary to suppress all grade crossings. But a proof, however, that projects of this kind are practical is that two great German electrical construction companies are after the concession of the Berlin and Hamburg line. The distance between these two cities, which is 286 km, and which is at the present time run in three and a half hours, will be covered in an hour and a half. It is probable that considerable increase in traffic will result. Dr. Schulz stated, however, that he could not at the present moment furnish precise information on the financial question, and he asked whether the establishing of a line of this kind between Washington, Baltimore, Philadelphia and New York would not be profitable.

Mr. Sabouret (French Western Railway) contributed details on the electric installation of the line from the Invalides to Versailles, similar to those on the line from Paris to Juvisy. The main reason which has induced the French Western Railway Company to introduce electric traction on this line is the existence of a terminal station at Paris which is partially underground and of a tunnel 3½ km long on a continuous grade of 0.8, where it was necessary to avoid smoke.

Ten electric locomotives and two auto-motor trains are in service on this line, with different types of motors, some geared and some not geared. At the great speeds (82 km to 100 km per hour) which the trains acquire while descending, the gearless motors, whose armatures are mounted on a hollow shaft, and are connected to the wheels through springs, offer important advantages over the geared motors. It has also been stated that the "mazout" lubrication is better than the American way of lubricating by grease. The service consists of four to five trains per hour in either direction, and while the kw-hour does not cost more than 5 centimes to 6 centimes at the power station, the cost of operation of electric traction is noticeably higher than that of steam traction.

Mr. Auvert (Paris-Lyons-Mediterranean Railway Company) stated that his company has been for a long time considering the question of electric traction. It has introduced, in 1901, this system on its line from Fayette to Chamonix, using motor-car trains. This line operates under special conditions, because of very steep grades, and the solution adopted for it, while giving full satisfaction, cannot be considered to be of universal application.

A. Wilson (North-Eastern Railway, England) gave some information on the use of electric traction on the suburban lines of that company near Newcastle-on-Tyne. He also furnished some data on the cost of operation of these lines, stating, however, that there was considerable difficulty in making a satisfactory comparison with steam traction. Electricity permits a better utilization of the existing lines, and experience shows that the improved service which follows generally leads to increased receipts.

The cost of electric traction for the month of February, 1905, was as follows:

Mileage of trains	92,541
Mileage of cars	254,938
Average number of cars per train	2.75
Total energy consumed (kw-hours)	647,140
Energy consumed per train mile (kw-hours)	6.993
Energy consumed per car mile (kw-hours)	2.538
Average cost of power per car mile (pence)	1.601
Engineer's pay per car mile (pence)	.297
Conductor's pay per car mile (pence)	.217
Total cost of traction per car mile (pence)	2.115
Total cost of traction per train mile (pence)	5.7

Replying to an inquiry from Mr. Moffre (French Southern Railway), who wished to know whether single-phase motors have been applied to traction in the United States or elsewhere, K. Steinbiss (Royal Prussian Railways) said that in addition to the trials made in Germany with electric traction by direct-current motors (for instance, on the Wannsee Railway), some single-phase motors have been in operation since 1903 on the Niederschoeneweide-Spindlersfeld line near Berlin. The motors employed are of the Winter-Eichberg system; the speed is from 40 km to 60 km per hour; trains are made up of one or two auto-motor cars, with or without trailers; the heaviest train contains five cars and weighs 150 metric tons.

Encouraged by the results given by this trial, German engineers are applying the same system to a line connecting Hamburg, Altona and Blankenese, which is 26 km long. The trains in ordinary service will consist of two cars, with three axles each (one two-axle truck and one independent axle), with a total of 100 seats; these trains will be run at a speed of 60 km per hour, with three minutes' headway between trains. The work of equipping the line has been begun; it is to be opened to traffic Oct. 1 of next year.

Mr. Gerard (Belgian State Railway) called attention to the importance of the question of the net cost of electric traction, and asked that this question be placed on the programme of the next session of the Congress. He then considered the question of the mechanical connection between the motor and the axle, and expressed the opinion that motors without gearing are better than geared motors where few stops are made. He finally inquired whether any of the members could furnish information as to the utility of protecting the third rail, either at parts of stations accessible to passengers or at places where railway employees have to walk the tracks or over the entire length of lines operated by electric traction.

Th. Laurent (Paris-Orleans Railway) replied that on the Orleans Railway the third rail is protected for its whole length only within the city limits of Paris, on account of the tunnels. Outside the city the protection of the third rail is limited to stations, not only at places accessible to passengers, but also at places where employees may pass. It was his opinion, however, that the precautions taken were somewhat exaggerated; no serious accident due to the third rail has occurred since the line was opened to traffic.

W. D. Young (Baltimore & Ohio Railroad) said, in the first place, that he could give more complete data on the subject of single-phase motors than were contained in his report. Since this report was written two lines equipped with this type of motor have gone into operation in the United States—one near Indianapolis and the other between Bloomington and Pontiac, Ill. As for the third rail, he did not believe it was as dangerous as people said. Ten years ago there was installed in Baltimore, to avoid the third rail, a system of overhead wiring, which proved very expensive and gave a great deal of trouble, particularly in the tunnels, which extend over half the length of the line; the corrosion caused by the sulphurous smoke and vapors from the locomotives finally made it necessary to renew this line throughout. As all the changes and repairs had to be made without interrupting the service, and working with live wires, the expense was very great. Consequently his company decided three years ago to replace this overhead wiring with a third rail. This third rail is protected between stations by guard boards; at stations the third rail is entirely enclosed, except at the top, where a slot is left for the contact shoe. As an additional measure of safety, a system of automatic switches has been installed at the stations and at points where the workmen most frequently cross the tracks, but this system works irregularly, and therefore is not very reliable. Last year the line was extended across the North Baltimore station, where, passing this station, the third rail has merely been omitted for a distance of 700 ft., over which the trains are carried by momentum. In a new station all danger could be avoided by using elevated platforms. In reply to a question put by Mr. Laurent, Mr. Young explained the means employed in America to prevent trouble from sleet on the third rail. The Manhattan Elevated Railway Company uses for this purpose, and apparently with success, scrapers held against the rail by compressed air. Mr. Young prefers using a solution of chloride of lime, regulating the density to the temperature. This method is very cheap and entirely efficient. Finally, Mr. Young pointed out the importance of the different railroad companies arriving at a definite agreement on the question of the location of the third rail. On the Baltimore & Ohio Railroad the horizontal distance between the axis of the third rail and the axis of the track rail nearest to it is 31½ ins.; the height of the third rail above the track rail is 3½ ins. This height is almost the same everywhere, but the horizontal distance varies greatly with the different companies, and it would be very desirable to make these dimensions uniform.

Mr. von Leber (Austrian Government) found the reasons which have led the Baltimore & Ohio Railroad to replace the overhead trolley by the third rail very interesting. At Vienna the question is at present discussed, in view of the electrification of the Metropolitan. As to the protection of the third rail, he agreed with the opinion of Mr. Laurent that it is useful at stations only. He preferred the complete protection used on the Orleans Railroad to that afforded by two side planks, which do not prevent a person placing his foot on the conducting rail, and which also make the removal of snow more difficult. The method of passing by momentum the distances between the ends of the third rails did not appear to him entirely desirable. He finally stated that experiments had been made in Vienna to compare the relative desirability of geared and gearless motors; he preferred the latter.

F. Paul-Dubois (Paris-Orleans Railway) desired to supplement the information given by him in his report on the subject of electric traction on the line Paris to Juvisy. Since the extension of electric traction to suburban traffic, the annual kilometric run of electric trains has increased from 225,000 km to more than 500,000 km, and the cost of the traction per train-kilometer has decreased to about 60 centimes.

After an exchange of opinions, in which took part Messrs. Gerard, Auvert, Thonet and von Leber, the president put to vote the following conclusions, which were adopted by the sections:

CONCLUSIONS

The section recognizes that electric traction should be considered at present as an important auxiliary of steam traction, being capable of handling certain portions of railway traffic with advantage and economy.

It is impossible in a general exposition to point out the exact service to which electricity can be most readily applied, the application being essentially a question of local conditions, each particular case requiring special study. In this study there must be taken into account the expense of electrification, and the following points: First, condition of service—that is, the frequency and weight of trains; second, the physical conditions of the line, such as length, profile and plan. In comparing the expenses of operation by electricity and by steam, the interest and depreciation on the electrical installation must be considered.

The increase in revenue which the improvements in service will generally produce should also be given consideration. An important point in the use of electricity is the increase in the present station facilities resulting from the reduced number of movements in the stations by the use of electric traction.

From the information furnished to the congress it would seem that with the third rail, as now used, security can be assured under favorable conditions without it being necessary to cover or protect the third rail for its entire length.

The congress has heard with much interest the results experienced with high-speed electric traction between Marienfeld and Zossen, and also of the tests and first application for traction purposes of the alternating-monophase motors in several countries.

Finally, the congress recommends that on account of their future usefulness, exact data on the cost of electric traction be obtained.

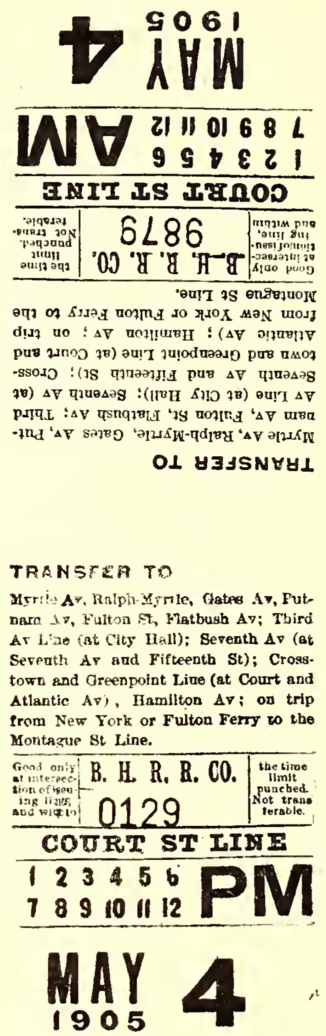
THE NEXT CONVENTION

The permanent commission has considered the place of meeting for 1910, but has not yet made any definite decision. The suggestion has been made that the meeting be held in Switzerland, and the commission has received assurances from that country that a cordial welcome will be given to it if it approves this proposition. A definite announcement will be made later.

Two masked men held up a car on the Tamaqua & Lansford Street Railway at a turn-out west of Mauch Chunk on Tuesday night, May 16, shot one of the passengers, stole all of their valuables, and escaped. The eastbound car from Tamaqua at 9:30 o'clock ran into a switch that had been set by the bandits. The motorman threw on the brake, and as he did so the two masked men jumped out from the woods and boarded the car, one at the front end and the other at the rear. As the man in the rear entered the door he drew a revolver and fired a shot which penetrated the foot of a passenger who sat near the door. All complacently complied with the command of hands up, and each in turn was rifled by one of the men, while the other held the rest of the passengers in subjection by flourishing a revolver. The car was run to Mauch Chunk without stop after the robbers had left, and soon a posse was in pursuit. At midnight two persons were captured who are believed to have been the perpetrators.

NEW TRANSFER TICKET FOR BROOKLYN

The Brooklyn Rapid Transit Company has recently adopted a new form of transfer ticket which is an improvement over those previously used, and has features of interest. The former transfer used involved important features, including the daily issue plan in which each transfer has printed upon it the date for which it was valid, but even with this, trouble was experienced in the distinction between the A. M. and P. M. issues, many afternoon rides being obtained by passengers on forenoon transfers. This the new ticket avoids by the use of separate tickets for A. M. and P. M., which are identical in form and size, differing only in color of printing, black ink being used on the A. M. form and red on the P. M. form.



NEW TRANSFER TICKET

The novel feature of the ticket lies in the method of padding them for the conductors to handle. The A. M. and P. M. tickets, each of which are about 2 ins. x 3 ins. in size, are printed upon the same sheet, a sheet about 6½ ins. long, which has the perforations and padding stub at the middle. The tickets are thus padded at the middle so that a conductor is merely required to tear off from one end for the black or A. M. tickets, and from the opposite end for red or P. M. This feature renders the ticket fully as convenient as the former style in handling, but the day is now successfully divided thereby, and moreover, the ticket cannot be tampered with.

Another interesting feature lies in the departure from the former practice of this company in requiring transfer time limits to be punched in fractions of hours. It will be noted from the new ticket that the hours are not divided, it being required merely that the time be punched at the nearest hour in advance. Thus, if a conductor gives out transfers unpunched, as often happens under the stress of "rush-hour" conditions, there is no danger of advantage being taken by the passenger of the opportunity to ride upon the ticket later in the day. This company is coming to find the punching of time limits to fractional parts of the hour as a precaution of little importance, and is seriously questioning its advisability, especially under heavy traffic conditions. The new ticket form will, it is thought, furnish valuable information regarding this practice.

The Massachusetts House has passed to be engrossed the bill relative to the construction and operation of street railways upon private lands. Under the present law, such taking is allowed only for the avoidance of curves or grades. This bill allows street railways to take any land by lease or purchase. It does not, however, allow the taking of land by eminent domain, but if the street railway can purchase or lease land it could build a road across country in the same manner as under the eminent domain bill. The bill has already passed the Senate.

ELECTRIC TRACTION IN FRANCE

BY F. PAUL-DUBOIS,

Engineer of Bridges and Highways, Engineer of Rolling Stock and Motive Power, Orleans Railway of France

Reviewing the status of electric traction in France, the author points out that the system of continuous-current traction with third rail can now be considered as well established and leaves but little to be desired from the technical point of view, although further improvement is always possible and desirable. Continuous-current motors are economical, convenient and reliable. The system of electric traction by direct current, however, has one very grave defect for railroad operation, as it is not suited to the use of high-voltage currents. Up to the present, hardly anything beyond 700 volts has been used in practice for operating continuous-current motors for traction, and the transmission of energy at such a moderate voltage results in a prohibitive cost for the mains as soon as the amount of energy or the distance over which it is to be transmitted become at all large. From this point of view there is a radical difference between tramways and railways. The method usually adopted for railways has been the use of transformer sub-stations receiving a supply of high-voltage current from a central station and feeding the different sections of line with continuous current. This system has been applied more particularly on the line from Les Invalides to Versailles (a description of which will be found in the Street Railway Journal for Nov. 15, 1904), on the line from the Quai d'Orsay to Juvisa (described in the Street Railway Journal for Feb. 28, 1903) and on the Paris Metropolitan (which has been described in the Street Railway Journal at various times), and is to be applied on the extension of the Fayet-Chamonix line to the Swiss frontier. (A description of this line will be found in the Street Railway Journal for Feb. 7, 1903.) This arrangement, which at present is in general favor, makes it possible to extend the field of action of continuous current very largely. It would evidently be a great advantage from the economic point of view to increase the voltage at which the energy is transmitted and at the same time reduce the number of connecting links between the central station and the motors on the trains.

Numerous attempts in this direction have been made. Some of them are also based on the use of continuous-current motors. As belonging to the latter class, may be mentioned the "three-wire" system applied in France on the Grenoble-Chapareillan Tramway, and on a section of the St. Georges de Commiers-LaMure. (This line was described in the Street Railway Journal for Oct. 31, 1903.) This system, which makes it possible to double or even quadruple the voltage of distribution while retaining the same voltage at the motor terminals, can be installed in several ways, either with a single wire divided into sections of alternate polarity, which makes it necessary to distribute the trains so that the load on all sections is practically the same, a condition which is impracticable on railways, or with two wires, one positive and one negative. In both cases the track performs the office of a neutral wire.

In the two applications made in France, the motors on the same vehicle are connected on opposite sides of the three-wire system, so as to balance the demand for energy. The lines in question, which are single-track lines, have two insulated conductors, showing a difference of potential of 1200 volts in the first case and 2400 volts in the second; the motor cars of the Chapareillan line have two 600-volt motors in series, and the La Mure locomotives have four motors of the same voltage also connected in series.

The use of 2400 volts in the distribution has the result of reducing the loss in the mains to one-quarter of what it is with the ordinary voltage. Thus there is already a considerable economy in the first cost of the conductors.

However, this solution has its defects. In the first place, there is the complication of having two conductors at different voltage, particularly at switches and at crossirgs; then the motors have to be coupled up permanently in series, and consequently the "series-parallel" control has to be abandoned; finally, as there may be a difference of potential of as much as 1200 volts between the different parts of the locomotive and the ground, there is greater difficulty in maintaining the insulation, particularly that of the motors.

Polyphase Current Motors.—Up till lately the only alternating-current motors capable of being utilized for traction were asynchronous polyphase motors.

These motors have received in Europe, principally in Italy and Switzerland, a certain number of applications, some of them being important ones. The type generally used is the three-phase. On the Valtellina line the current is supplied at 3000 volts, and on the experimental Marienfelde-Zossen line even at 10,000 volts.

Although these motors give an interesting and advantageous solution in certain cases, they do not appear capable of general application.

Against them, in the first place, is the fact that each track requires at least two working conductors at different voltages, and even three if the track rails are not used as a conductor; the resulting complication becomes very inconvenient at switches and crossings; moreover, the maintenance of the insulation becomes more difficult.

Then the polyphase induction motor is essentially a constant-speed motor; any other speeds than those near synchronism can only be obtained at the cost of rheostatic losses, or by means of more or less complicated devices, the usual one being that known as "concatenation." This latter arrangement makes it possible to obtain a good efficiency at two different speeds, but its realization is not without practical difficulties.

With motors of this type the power stations and the lines carrying the current must have a greater capacity for an equal service than with continuous-current motors, owing to the greater power required, both in order to haul trains up gradients without reduction of speed and also for starting, and again owing to the comparatively low power factor of three-phase traction systems. This increased capacity results in a corresponding reduction in efficiency, which is all the greater because it is not possible in this case to reduce the variations of load by using accumulators, so that the amount of energy consumed, other things being equal, is about the same as in the ordinary system with continuous current and transformer sub-stations.

Hence the cases in which the system of three-phase motors is distinctly superior are comparatively rare. It may be stated in a general way that the conditions most favorable to its use are when the lines are long, when there are long intervals between the trains and they have few stops, or when the lines have long and regular gradients, particularly if there is plenty of motive power and it is cheap; under such conditions it is cheaper both to install and to maintain than the preceding system. In the case of mountain railways, three-phase motors have another valuable advantage, which is the automatic limitation of the speed and the return of the energy to the line while running down hill, when the motors act as generators.

The existing applications of polyphase motors to traction mostly belong to one or other of these classes.

Single-Phase Current Motors.—A much more extended field seems to be available for single-phase alternating-current motors, long forgotten in this connection, but which recent improvements have once more brought into notice.

The only monophase alternating-current motors at present

* Abstract of paper read at the meeting of the International Railway Congress, May 11, 1905.

existing which have the speed and torque properties suitable for application to traction are the "commutator" motors.

The question of applying motors of this kind to traction purposes has lately been taken up in several different countries simultaneously—thus in America by Mr. Lamme, in Italy by Mr. Finzi, in Germany by Messrs. Winter and Eichberg, in France by Mr. Latour. The motors tried are either of the series type with laminated poles, or of the repulsion type, or are a combination of both these types.

The results already obtained raise the hope that it will not be long before there will be a monophase motor which will work satisfactorily, give a good torque at starting, a high power factor under normal conditions and an efficiency similar to that of the best continuous-current motors. Under these conditions the simple alternating-current motor is of very great interest, but it is necessary to wait for further results before any definite conclusions as to this system can be reached.

SUMMARY

In summarizing the situation, the author believes that the use of electric traction on railways is already practicable in all cases where its use would be considered advisable from the economic point of view.

Short-distance passenger traffic seems to offer the most favorable field for electric traction. Moreover, it is almost exclusively to this class that the applications already made on railways belong. Electric traction for freight trains exists only as an exception justified by peculiar local conditions. It may be said in a general way that in services of this kind the economy of the system increases with the reduction in the weight of the trains and with the increase in their number. Leaving out of consideration metropolitan railways, which form a special class for which electric traction is now a necessity, the suburban lines of some large towns may offer conditions favorable to the use of electricity. The latter, in the case of service with many stops, has the great advantage that it makes it possible to increase the average speed materially, owing to the rapidity of starting electric motors. The absence of smoke, the better lighting of carriages and stations are other advantages, which although only of a secondary character, yet also contribute considerably to the general improvement of the service.

Similar conditions will be found to occur on sundry busy lines connecting large centers, not very far apart, in industrial districts, where the service must assume as nearly as possible the character of a tramway service. On lines of this kind and even on certain secondary railways, the increased facilities of transport made possible by electric traction may lead to important increases in the traffic and in the receipts. Another case where the adoption of electric traction is worthy of consideration is that of lines which are worked up to their full capacity. For electric traction indeed makes it possible, under certain conditions, to increase the capacity for traffic, while avoiding more costly measures such as quadrupling the track or enlarging the terminal stations. This possibility is due in the first place to the greater speed of the trains, resulting from quicker starting and less loss of speed up gradients, and secondly to the reduced blocking up of the terminus stations owing to the smaller number of operations necessary to receive a train and then clear the siding for the next train.

The great capacity of electric motors is especially advantageous on mountain railways, whether adhesion or rack railways. An electric locomotive need not weigh more than 40 kg to 50 kg per horse-power (89 lbs. to 112 lbs. per British horse-power), and the equipment of a motor car not weigh more than 20 kg to 25 kg per horse-power (45 lbs. to 56 lbs. per British horse-power). Electric traction, moreover, makes it possible to obtain the maximum adhesion, by making all the car wheels driving wheels. It therefore makes it possible to locate lines with sharper curves and steeper grades (for instance, the Fayet-Chamonix line, Paris-Lyons-Mediterranean Railway), which are cheaper to build. The saving effected may in some cases be so large as to cover, or even more than cover, all the additional expenditure for the installation of power stations and transmission lines.

The relative lightness of electric vehicles also makes them suitable for obtaining very high speeds. The large amount of power required to run a train at from 150 km to 200 km (93 miles to 124 miles) per hour can more easily be furnished by electric motors fed from outside than by a steam locomotive, the weight of which increases rapidly with the speed to be attained. The recent experiments made in Germany have proved (if indeed it was necessary) the superiority of electricity from this point of view.

The most serious objection to such a great increase in speed is the expense. In the first place, on very busy lines, which alone could serve as a motive for the use of high speeds, it would be impossible to run trains at 200 km (124 miles) per hour, between ordinary trains, without disturbing the whole time-table and making the ordinary traffic impossible. It would therefore be necessary to build new lines, either by adding new tracks to the existing ones, or, better, by building entirely new lines with curves of large radii and a wider roadbed so as to have a greater distance between trains. The track itself would have to be strengthened materially. In the interests of safety it would also be necessary to absolutely prohibit level crossings, junctions and other dangerous features. Taking it altogether, such a road would cost much more than the existing lines, quite apart from the electric equipment. Moreover, as a high-speed line would also be of considerable length, for it would scarcely be worth while to incur such a large expenditure merely in order to save one-quarter or half an hour on a journey, the capital required for construction would be enormous.

To earn dividends on such a capital and to meet the working expenses, which also would be very high, were it only on account of the great increase in tractive effort at higher speeds, one could only depend upon passenger traffic, and perhaps on some additional receipts from parcels traffic. No doubt cases will occur, sooner or later, where the development of the communication between two large centers may justify, from the economical point of view, the building of such a line. But in France, at least, this case does not seem to be likely in the immediate future.

The author's final conclusions were printed in the Street Railway Journal for April 29, 1905, but are here repeated. They are as follows:

CONCLUSIONS

On the whole, it seems to us that electric traction should at present be looked upon as a useful auxiliary to steam traction, capable of operating certain parts of railway traffic with advantage and economy. The principal cases in which its adoption may at present be feasible are: Firstly, on lines which are chiefly underground, then on metropolitan and on suburban lines, on interurban lines of limited length and with much traffic, on railways with steep gradients, and on lines which are worked up to their full capacity.

It is impossible to indicate in a general report in any more definite a way the cases in which the system of working may lend itself to the application of electricity; it is essentially a question of degree, and each individual case requires special examination. In this examination special consideration must be given to the cost of the electric equipment, the principal factors of which are in the first place the conditions of working, the number and weight of the trains, and, secondly, the conditions under which the line is built; its length, profile and plan; then the charges for interest and sinking fund of the capital outlay required must be compared with the economy which electric traction will give as compared with steam traction.

If it is a question of a new line, the adoption of electric traction may in certain cases result in a lower cost of construction, whereas in the case of existing lines the value of the rolling stock which will be rendered useless by the introduction of electricity has to be taken into consideration and written off.

Among the conditions in favor of electric traction are naturally the proximity of easily utilizable water power or of other cheap sources of energy, such as coal pits and blast furnaces.

In comparing the cost of traction, we must allow in the case of electricity, in addition to the eventual economy realized in the production of energy, for the reduction of dead weight resulting from the smaller weight of electric locomotives, the reduction in the cost of driving and of maintenance, as well as for the accessory economies capable of being effected in shunting operations at stations, in lighting the stations and trains, etc.

Finally, if so happens, the increased receipts which may result from the improved service have also to be taken into consideration.

In any case, the problem becomes in the end a financial and economic one.

APPENDIX

In an appendix Mr. Paul Dubois adds to his paper an extended account of the electrified steam roads in Europe to which he had already referred. Descriptions of these installations have already appeared in this paper (see list of references above), but some additional facts and recent figures on cost of construction and operation are presented herewith.

EXTENSION OF THE ORLEANS RAILWAY FROM PARIS TO JUVISY

The company has one main power station at Ivry, and generates 5500-volt three-phase 25-cycle current, and three rotary sub-stations, including one at the power station. Part of the current is used as three-phase for lighting and stationary motors. The output in 1903 (that is to say, before the extension of electric traction to Juvisy and the addition of the third generating set) amounted to 4,871,317 kw-hours of three-phase high-tension current; of which 4,739,343 were transmitted to the sub-stations, to be there transformed into direct current, and 131,969 were utilized direct as three-phase current, after reduction of voltage.

The mean consumption of fuel per kw-hour of three-phase high-tension current supplied was 1.585 kg (3.494 lbs.) per kw-hour; the fuel consists of a mixture of Anzin or Liévin pitcoal, and of cinders from locomotive smoke-boxes, mixed in the proportion of about 2 to 1.

The construction cost of the installations can as yet only be given approximately, as some of the accounts have not yet been made up. It may, however, be stated that it will amount, as far as the traction alone is concerned (*i. e.*, deducting the expenditure in connection with lighting or with other motive power), to about 7,450,000 francs ($1,490,000), made up as follows:

Power stations (2000 kw)	fr.2,065,000	$413,000
Transmission system (22.18 miles)	515,000	103,000
Transformer sub-stations (three)	1,075,000	215,000
Working conductors (37.29 miles)	2,315,000	463,000
Rolling stock (11 locomotives and 5 motor cars)	1,400,000	280,000
Miscellaneous	80,000	16,000
	fr.7,450,000	$1,490,000

The results of electric operation on the extension from Austerlitz to Quai d'Orsay (the original section) during 1903 have been as follows:

The average number of trains running on the extension was 150 per day.

The distance of 4 km (2.5 miles) is covered, in either direction, in 7 minutes by the express trains, and in 9 minutes by the local trains, which stop at Pont-Saint-Michel station; that is, the average inclusive speeds are 34.3 km and 26.6 km (21.3 miles and 16.5 miles) per hour respectively. The maximum authorized speed, owing to the sharp curves, is only 50 km (31 miles) per hour.

The mileage of the electric locomotives was 225,072 km (139,856 miles) when hauling trains, and 48,808 km (30,328 miles) when not hauling trains or when engaged in switching, which makes a total of 273,880 km (170,184 miles, or an average per locomotive of 34,325 km (15,115 miles).

The work done amounted to 34,329,524 tonne-km (23,601,505 ton-miles), locomotives not included. The average weight of the trains hauled thus amounts to 152.5 tonnes (167 tons), the ton being in all these statistics 2000 lbs.

The electrical energy consumed for traction amounted to 1,367,080 kw-hours of direct current, measured at the switchboards of the sub-stations, so that the average energy consumed amounted to 3.982 kw-hours per 100 tonne-km (5.81 kw-hours per 100 ton-miles) hauled, and to 6.073 kw-hours per train-km (9.773 kw-hours per train mile), switching and other operations included.

The average cost of operation per kilometer of train hauled electrically amounted in 1903 to 0.82687 francs ($0.2555 per mile), not including the octroi taxes. This figure is made up per train-kilometer as follows:

Depot charges	fr.0.01656	$0.003312
Train staff	0.31152	0.062304
Electrical energy	0.40905	0.081810
Lubrication	0.00972	0.001944
Various expenses	0.00502	0.001004
Maintenance and repairs	0.07500	0.015000
	fr.0.82687	$0.165374

The cost for power, which is the largest item, is as follows:

COST PER KW-HOUR AT POWER STATION

Staff	fr.0.012914	$0.0025828
Fuel	0.022192	0.0044384
Lubrication	0.001688	0.0003376
Miscellaneous	0.002761	0.0005522
Maintenance and repairs	0.000734	0.0001468
Totals	fr.0.040289	$0.0080578

COST PER KW-HOUR AT SUB-STATION TERMINALS

Energy, 0.040289 ÷ 00.782 =	fr.0.051520	$0.0103040
Staff	0.007373	0.0014746
Lubrication and miscellaneous	0.000145	0.0000290
Maintenance and repairs, transmission system included.	0.004999	0.0009998
General expenses	0.003316	0.0006632
Totals	fr.0.067353	$0.0134706

The cost per train-km of staff, as shown in the first table, is rather high, on account of the special character of the service carried out, which is really a switching service, and as such gives a low utilization of the rolling stock and of the staff; thus the average yearly mileage of a locomotive crew is only 18,258 km (11,345 miles). The crews have up to the present each consisted of two men, an electrician and an assistant, at a total cost for wages of about 4,500 francs ($900) per annum, premiums included; but the Orleans Railway has just been authorized to dispense with the assistant. The small utilization of the locomotives also has an influence on the figures for the average cost of maintenance and of repairs per train-kilometer (per train mile). The maintenance of the electric plant is really very small, and is limited, in addition to the daily inspection, to a detailed weekly examination of the whole equipment.

The motors act well. The controller requires no maintenance except the renewals of the ends of the contact segments, which become burnt out; these renewals are very easily carried out. The third-rail shoes have an average of 30,000 km to 35,000 km (18,640 miles to 21,750 miles). Exceptional expenditure was, however, incurred in the year 1903 by turning up all the wheel tires and by repairing and making equal to new four of the electric locomotives.

On the whole, owing to the circumstances just mentioned, the average cost of traction by electric locomotive is appreciably higher per train kilometer (per train-mile) than the average cost of traction by steam locomotive on the whole of the Orleans Railway system. But if we compare the practical results obtained by means of electricity in the special case of the extension from Austerlitz to Quai d'Orsay (where it was necessary to work the service without producing smoke or gases), with those which could have been obtained by any other system of smokeless traction, we find a marked advantage in favor of the system adopted, if we take into consideration the interest and sinking fund of the capital outlay in both cases. For if we add to the cost of traction as calculated above, the charges for interest and sinking fund, taken at 5 per cent of the capital outlay on the installation of electric traction on the Austerlitz-Quai d'Orsay section, we find that the total cost per train-km is 1.32 franc ($0.264 per train-mile), whereas, according to the most economical estimates, the net cost of any alternative method of traction, such as locomotives condensing their own steam, and, a fortiori, hot water and compressed air locomotives, could not, under the conditions, have been less than 1.40 franc to 1.35 franc per train-km ($0.28 to $0.27 per train-mile), charges for interest and sinking fund included.

The Orleans Railway reckons on materially reducing its cost of electric traction per train-kilometer by applying this system of traction to the suburban trains between Paris and Juvisy; this will have as result that the average annual mileage of the electric locomotives and of their crews will be increased about 60 per cent, and the utilization of the power station will be improved even more, proportionally reducing the cost of generation of energy.

LES INVALIDES—VERSAILLES ELECTRIC LINE OF THE QUEST RAILWAY, PARIS

This line is 17.6 km (10.94 miles) in length, with ten local stopping stations between the Les Invalides station in Paris and Versailles. There are ten electric locomotives and two multiple-unit trains. The total mileage of the electrically-operated trains amounted in 1903 to 367,170 km (228,153 miles), 302,922 km (188,230 miles) for trains hauled by electric locomotives; 64,248 (39,923 miles) for motor trains, corresponding to 28,194,900 tonne-km (19,-

301,192 ton-miles), of which 23,455,800 tonne-km (16,066,176 ton-miles) were done by the former class of trains, weight of locomotives not included, and 4,739,100 tonne-km (3,246,096 ton-miles), including the motor cars, by the latter.

The average weight hauled per locomotive thus amounts to 77.4 tonnes (85.2 tons), weight of locomotive not included; that of the motor trains was 73.7 tonnes (81.0 tons), weight of motors included.

The energy consumed for hauling these trains was 2,360,000 kw-hours of high-tension current, measured at the terminals of the power station. The average power consumed per train-kilometer thus amounted to 6427 kw-hours (10,343 kw-hours per train-mile) at the power station; the corresponding amount as measured at the sub-stations was about 4500 kw-hours (7242 kw-hours per train-mile). Thus the general efficiency of the transmission and transformation of energy from the switchboard of the power station to the terminals of the sub-stations is 70 per cent. The corresponding average consumptions of power per tonne-km of train were about 64 watt-hours and 45 watt-hours (93 watt-hours and 66 watt-hours per ton-mile of train) respectively.

The net cost per kilowatt-hour of direct current supplied by the sub-stations amounted for the same year to 0.12 franc ($0.024), interest on capital and sinking fund for the installation not included, but including the maintenance of the high-tension conductors. The cost is made up as follows:

NET COST PER KW-HOUR AT STATION, MAINTENANCE OF HIGH-VOLTAGE CABLES INCLUDED

Staff	fr.0.01426	$0.002852
Coal	0.03720	0.007440
Lubrication, water, maintenance, repairs	0.00372	0.000744
General expenses	0.00682	0.001364
Totals	fr.0.06200	$0.001240

NET COST PER KW-HOUR AT TERMINALS OF SUB-STATIONS

Energy, 0.06200 ÷ 0.7 =	fr.0.0886	$0.01772
Staff	0.0133	0.00266
Lubrication and Miscellaneous	0.0013	0.00026
General expenses	0.0168	0.00336
Totals	fr.0.1200	$0.02400

The fuel burnt at the station in Dourges pit coal, mixed with 25 per cent of best coal and 12 per cent of cinders, cost about 20 francs ($4) per tonne, delivered at station. The mean consumption is about 1.700 kg (3.748 lb.) per kw-hour of output at the power station.

The cost of traction per train-kilometer (per train-mile) is as follows:

Train staff and drivers	fr.0.105	$0.03244
Electric energy	0.540	0.16686
Lubrication and miscellaneous	0.019	0.00588
Maintenance and repairs of locomotives and motor cars	0.162	0.05006
Maintenance and repairs of working conductors*	0.078	0.02410
Totals	fr.0.904	$0.27934

* This amounts on the average to fr.700 per year, and per kilometer ($140 per year and per mile) of working conductor.

The staff at the station and sub-stations include sixty-six employees (twelve of whom attend to the management, the bookkeeping, the store room, the handling, the watch service, etc.; seventeen engineers and greasers, six electricians, twelve stokers, fourteen men attending to the maintenance and five acting as reserve). The locomotive and motor car crews each consist of one driver, whose pay averages 2,200 francs ($440) per annum, premiums included.

The ordinary maintenance of the electric rolling stock is attended to at the Champ-de-Mars depot. Main repairs are carried out at the general shops of the company.

The average annual mileage is 31,000 km (19,260 miles) per locomotive, and 52,000 km (32,310 miles) per motor car, including switching operations when running empty.

THE FAYET-CHAMOUNIX ELECTRIC DIVISION OF THE P. L. & M. RAILWAY

This line is run from April to December only. During 1903 eight passenger trains were run daily each way, at other times three. The ascending speed is 20.3 km (12.6 miles) per hour, and the descending 18.4 km (11.4 miles). In 1902 the train mileage was 58,000 km (36,040 miles), and the ton-mileage 6,000,000 tonne-km (4,109,728 ton-miles). The energy consumption was 580,000 kw-hours, corresponding to 100 watt-hours per ton km (146 watt-hours per ton-mile). The cost per kw-hour in 1902 was 0.04 franc ($0.008), or a total of 1.95 francs per train km ($0.6026 per train-mile). The employees are paid 1,800 francs to 2,400 francs ($360 to $480) per year, and during the winter are employed in rolling stock repairs.

THREE-WIRE ROAD FROM ST. GEORGES-DE-COMMIERS TO LA MURE

This line is 31 km (19.3 miles) in length, of which 25 km (15.5 miles) have a nearly continuous grade of 2.75 per cent. Current is transmitted on the three-wire system, with 2400 volts between the outer wires and the track as a neutral. There is one locomotive, with four 125-hp motors connected permanently in two groups of two motors in series, and rheostatic control is used. The road is used mainly for hauling coal cars.

As regards the economy, the measured consumption for hauling up an empty coal train of trucks, weighing 110 tonnes, from La Motte-d'Aveillans to La Motte-les-Bains, up an average grade of 2.75 per cent, does not exceed 115 kw-hours, that is, 150 watt-hours per tonne-kilometer (219 watt-hours per ton-mile). If we add the consumption during shunting operations and during the descent of the same train loaded, we obtain a total of about 125 kw-hours for hauling up a train of twenty empty trucks and running it down loaded.

At the rate of 5 centimes (1 cent) per kilowatt-hour, this represents an expenditure of 6.25 francs ($1.25), whereas the same operation used to cost about 9.40 francs ($1.88), using coal at 32 francs per tonne ($5.60 per ton). It may, therefore, at present be stated that taking fuel only into consideration there is an economy of from 35 per cent to 40 per cent.

THE GRENOBLE-CHAPALEILLAN ELECTRIC TRAMWAY

This line is 43 km (26.72 miles) in length, and is interesting because it is also a three-wire road. The steepest grade is 4 per cent. The voltage between the two outer wires is 1200, and the rail is neutral. The trolley line is divided into three sections, each about 9 miles in length. To keep the voltage practically uniform on the three sections, notwithstanding the considerable variations in the current, owing to the inequalities of the irregular profile and to the very unequal intensity of traffic on the different sections, the current of the two feeders supplying each section passes through a booster consisting of two series dynamos, driven by a compound-wound motor, and consequently running at a practically uniform speed, which are connected to the two outer bus-bars. These generators raise the voltage of the current passing through them according to the output, so as to preserve sufficiently uniform voltage on the line.

PARIS METROPOLITAN RAILWAY

Some interesting statistics of this line are given. The cost of the electric equipment for the 24 km (14.9 miles) of line now in operation amounted at the end of 1902 to about 25,500,000 francs ($5,250,000), namely, 1,084,000 francs ($218,800) for the electric equipment of the track, 12,029,000 francs ($2,405,800) for the Bercy power station, 2,529,000 francs ($505,800) for the four sub-stations, 1,380,000 francs ($276,000) for the cables and conductors (high and low tension), and 8,476,000 francs ($1,695,200) for the rolling stock.

During 1903 the length open to traffic was 17.335 km (10.772 miles) up to Jan. 30, 22.912 km (14.237 miles) from Jan. 31 to April 1, 24.077 km (14.961 miles) from April 2 to Nov. 4, and 24.818 km (15.421 miles) after that date; the total car mileage during this year was 29,049,560 car-km (18,050,886 car-miles). The motor cars each run per year about 35,000 km (21,750 miles) on the average.

The power required for traction for the 29,049,560 car-km (18,050,886 car-miles) mentioned above amounted to 24,098,308 kw-hours of direct current, or about 860 watt-hours per car-km (1384 watt-hours per car-mile) on the average, the car weighing 12 tonnes to 13 tonnes. In addition to this, 2,863,778 kw-hours were required for lighting the stations and the tunnel, and 98,183 kw-hours for various accessory operations, making altogether 27,960,269 kw-hours of direct current. Of this amount 4,579,978 kw-hours were generated as direct current at Bercy power station. The rest was obtained by the transformation of 26,512,699 kw-hours of three-phase high-voltage current; of which 12,731,863 kw-hours were supplied by Bercy power station, 7,083,885 kw-hours by Le Triphasé of Ansières, and 6,696,951 kw-hours by the Moulineaux power station. The mean efficiency of the transformation of the three-phase current into direct current was thus 88 per cent.

The corresponding consumption of fuel at Bercy power station per kilowatt-hour amounted, on the average, to 1.339 kg (2.952 lbs.), of a mixture of pit coal and washed smalls, costing 29.49 francs per metric ton ($5.13 per short ton).

The average cost of operation amounted in 1903 to 26.08 centimes per car-kilometer (8.058 cents per car-mile), made up as follows:

	Centimes	Cents
Electric power	7.67	2.370
Cost of transmission	0.97	0.300
Maintenance of rolling stock	3.74	1.156
Train staff	3.32	1.026
Working staff	3.47	1.072

Maintenance of tracks, stations and roadbed, signals, telephone, electric conductors	1.87	0.578
General expenses	5.04	1.556
Totals	26.08	8.058

The total expenses were 7,577,060.82 francs ($1,515,412), and the total receipts, for transport, 17,290,839.35 francs ($3,458,168), and the number of passengers carried was 100,107,631.

THE BERLIN-ZOSSEN TESTS AND THEIR RESULTS

An interesting paper on this subject was presented by His Excellency Dr. Schulz, president of the Imperial German Railway Department, also chairman of the German investigation committee (Studiengesellschaft) on high-speed electric railways. It was in this second quality that Dr. Schulz presented the report upon the experiments on the Berlin-Zossen road.

The investigation committee on high-speed electric railways was organized at Berlin in 1899, and in the trial runs speeds of 200-210 km (124-130½ miles) per hour were reached, velocities far exceeding any other speeds before attained. The permanent way, consisting of steel rails, 12 m long, each carried on eighteen wooden ties, had a total weight of 224 kg per meter (454.5 lbs. per yard), including the guard rails. There were no curves of a radius smaller than 2000 m, and the superelevation of the outer rail was 80 mm. The grades were few and inconsiderable. The experiments proved that the standard type of permanent way, when sufficiently strengthened, is amply sufficient for speeds of 200 km per hour and more.

The two motor cars were of similar design to the latest types of European express train cars. Each car had accommodation for fifty passengers, with a length of 22 m, two trucks of three axles each and of a wheel base of 5 m; the total weight was 90 tons, uniformly distributed over the axles. Even at a speed of 210 km per hour the cars ran quite smoothly. This experience proves, in the words of Dr. Schulz, "that the general design of our express train cars can be applied to extra high speeds, if the wheel base is increased accordingly. It will be possible in future construction to reduce the dead weight of the cars."

Dr. Schulz then described the collecting devices, which are familiar to the readers of this paper, and which he said gave excellent success, and which "safely supplied the cars running at a speed of nearly 60 m, or 200 ft. per second, with as much energy as 2000 kw, and this even in unfavorable weather."

The motors were designed for a normal output of 250 hp each, and overload capacity of 750 hp, and were coupled directly, or by means of a spring coupling, to the driving axles. The trials showed that motors for a three-phase current are well suited for the operation of high-speed trains on main lines. To determine whether the motors could be run directly by the high-tension current, Siemens & Halske built an electric locomotive fitted with two motors for a tension of 10,000 volts. This locomotive with a dead weight of 40 tons, coupled to a train of 70 tons, reached a speed of 100 km per hour; when coupled to a train of 100 tons, 50 km per hour were made as a regular run. The current had an electromotive force of 8000-11,000 volts and 40-48 cycles. These motors gave satisfactory results on the trials.

TRAIN RESISTANCE

The total resistance in the car, consisting of the different kinds of mechanical friction and of the air resistance, was measured, and the following results were obtained:

(a) The friction resistance was found to be not more than 1.5 kg per ton of weight of the car at a speed of 5 km per hour. It slowly increased as the speed increased, and reached 300 kg with a speed of 200 km per hour.

(b) The air resistance increased much more and at a much higher rate with the increase in speed. The numerous observations gave the uniform result that the air pressure on 1 sq. m of front surface, or that measured at right angles to the direction of travel, is equal to the square of the velocity in kilometers per hour multiplied by the constant 0.0052. Assuming 7.5 sq. m to be the front area of a car, the air pressure on this surface with different speeds was as follows:

At 50 km	(31 miles) per hour	98 kg
100 "	(62 ") "	390 "
150 "	(93 ") "	878 "
200 "	(124 ") "	1560 "

The air pressure on the sides of the car is relatively small and depends a great deal on the direction and strength of the wind.

The air suction on the rear of the car has no importance and does not increase much with increasing velocity.

The air resistance on the car might be reduced by giving the car a parabolic head; if, however, the train speed should be increased considerably above 200 km per hour, the air resistance would increase at least to such an amount that the motors in the car would no longer be able to supply the necessary power to overcome it. Dr. Schulz states, therefore, that it is the air resistance which determines the limit of the attainable speed.

The resistance of a trailer is considerably less than that of a motor car, for the greater part of the front area of the second car is covered by the first, and it was observed that the air resistance on the trailer was but one-seventh of that of the motor car.

The amount of energy, the current and the voltage applied were observed at the feeding point of the experimental line, and also in the car itself. On the level and with no wind, the following average values were obtained for a motor car weighing 80 tons:

Speed		Energy Supplied	Output
Km	Miles	Kw	Hp
100	62	193	218
150	93	546	613
200	124	1190	1340

With trailers weighing 40 tons, and with an accommodation for fifty persons, the output for the same speed was only 49 hp, 116 hp and 233 hp. Hence it follows that it is considerably more economical to care for a crowded traffic by means of trains consisting each of several cars than by many single motor cars of the same capacity running in short intervals, although the latter would be much more desirable for the conditions of general traffic.

BRAKES

Westinghouse air-brake equipment and hand brakes were used. The brake-shoes were hollow and were cooled with water to prevent the rims and the brake-blocks from becoming overheated. At speeds of 170 km and 180 km, the brakes stopped the car within a distance of 1300 m and 1400 m, which corresponds to an average retardation of nearly 1 m per second^2. The admissible retardation can be increased to 1.5 m per second^2, without danger to the passengers, by raising the brake pressure, whereby trains running at speeds of 160 km and 200 km per hour can be stopped within 660 m or 1000 m.

For speeds of more than 120 km per hour the signals in cloudy weather could not be seen sufficiently soon. This was remedied by an electro-magnetic device arranged in the car, which, by means of contacts along the line, presented a red disc before the eyes of the driver when the signal was at danger. This device has never failed, even at the highest speeds.

CONCLUSION

In conclusion, Dr. Schulz makes the following remarks on the subject of safety: "As at the introduction of the steam locomotive, danger to the health of travelers was feared from very high speeds before these electric tests were conducted. I can state, however, from my own experience, that the passengers were in no way affected by the speed of 200 km per hour or more, which we often reached. Each engineer was at his place, occupied in making his observations, and the silence in the car was only interrupted every ten seconds by a bell signal to take readings on the instruments. The duty of the engineer, however, was more arduous, as he had uninterruptedly to observe with the greatest accuracy the run of the car, the line and the signals. Surrounded as we were by apparatus and wires which carried a current of 14,000 volts, we nevertheless felt perfectly safe; no personal injuries were ever sustained in spite of the short-circuits which occasionally occurred. It was possible during the run to observe the scenery comfortably, but persons standing on the platforms of the stations we passed could hardly be recognized. No injurious effects due to air pressure were ever felt when trains passed on the neighboring line, and spectators standing near the line had no uncomfortable sensations. More than 300 runs were made, and all without a single accident. Nobody was killed or injured, and no damage to property occurred. Bloody remains, however, of small birds who were killed were observed on the front of the car. These birds, doubtless, thought they could avoid the approaching train, but the electric car moved faster than any bird can fly, and killed them. These were the only accidents that happened.

"The investigation committee on electric high-speed railways has thus accomplished its work; the conditions have been determined under which electric main railways can be operated with high speeds, and it has been proved that such operation is not more dangerous than the present railway practice. Here is a vast field for work open to railway men associated with electrical engineers, and may the time not be far off when a real high-speed electric railway will be an accomplished fact!"

IMPROVEMENTS AT NORUMBEGA PARK

Under the management of M. C. Brush, general manager of the Boston Suburban Electric Companies, a number of changes are being made at Norumbega Park, Auburndale, Mass., the chief features of which have been described in previous issues of the STREET RAILWAY JOURNAL. Mr. Brush is of the opinion that a park of this nature, in order to hold the patronage from year to year, must have new attractions and improvements every season, for if the place is allowed to keep about the same appearance, with nothing new or interesting, people are apt to go elsewhere for their amusement. In line with these ideas, considerable work is being done at Norumbega in order to freshen it up and present new features for the enjoyment and convenience of the patrons.

One improvement that will undoubtedly be appreciated by the park patrons is a new toilet located near the theater. It was desired to make the toilet building as unobtrusive as possible, so it was built in the side of a hill, and the roof will be entirely covered with sod. As the line of the roof conforms closely to the slope of the hill, the building itself will be entirely hidden from view. The rooms will be ventilated by means of a flue running up the side of an adjoining building, where it will not be noticed. The entrance will be screened with bushes and shrubbery.

A new walk has been laid out on the side hill overlooking the Charles River, and as benches are to be placed at frequent intervals, this will afford another good vantage point from which to enjoy the view over the river and islands.

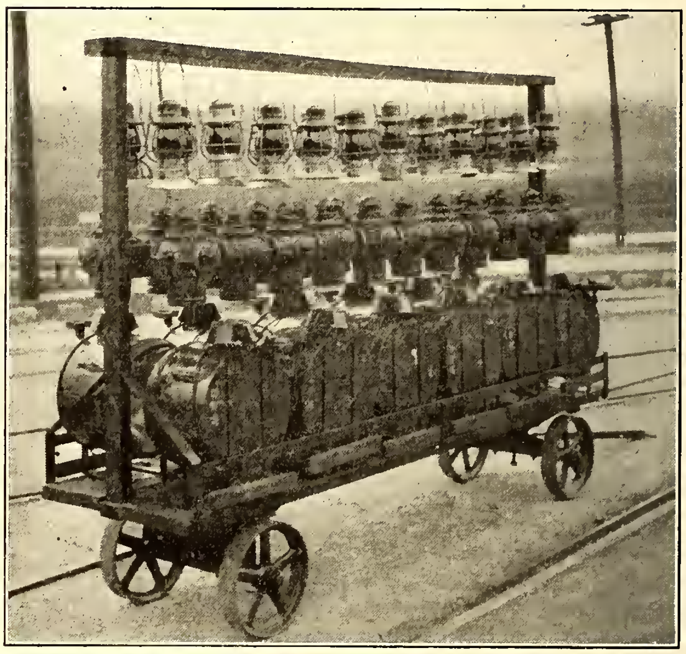
The chalet which contains the various coin-in-the-slot attractions proved so popular last year that an addition is now being built which will practically double the size of the building. The interior will be handsomely decorated, and a fountain 15 ft. in diameter built of rough stone will be laid out in the center of the building. The lighting will be accomplished by thirty-five Meridian lamps placed in the ceiling.

The zoo at Norumbega contains the finest collection of animals in New England, and several valuable specimens will be added this season. Four new cages are being built for the accommodation of some of the new animals. These cages will be of novel design and will have solid concrete floors, which can be readily flushed and cleaned.

LAMP TRUCK ON BOSTON & WORCESTER

At the shops of the Boston & Worcester Street Railway Company some confusion and inconvenience were formerly experienced in handling the headlights, tail lights and hand lanterns used on the cars. The outfit of lamps required by each crew consists of a headlight, two tail lights and two hand lanterns, and the task of carrying these back and forth between the shops and the tracks and having them ready for the cars on the early evening runs was quite an item.

To facilitate this work the lamp truck or wagon shown here-



LAMP TRUCK, BOSTON & WORCESTER

with was devised. As will be seen, it consists of a frame mounted on a low hand truck having flat-tired wheels. On the floor of the truck is room for twelve headlights, arranged in two rows of six each. Above these is a tier for twenty-two tail lights, and above this a third tier from which are hung eleven pairs of hand lanterns.

The truck is 8½ ft. long, 22 ins. wide at the floor, and stands 6 ft. high from the ground to the top piece. The uprights are made of 1½-in. x 3-in. stuff; the top cross piece is 1½ ins. x 7½ ins., and the middle cross piece is 1½ ins. x 4 ins. The frame is reinforced near the base with strips of ¼-in. x 1½-in. strap iron. The wagon was built at the company's shops at a cost of about $25.

When the cars come in from the last trips at night the crews hang their various lamps on the truck. Some time during the day the truck is drawn to a convenient corner of the yards, where the lamps are cleaned and filled, and the wagon is then moved to a point in front of the shops near the tracks, where the crews of passing cars can readily take such lamps as they may require.

The Fairmont & Clarksburg Traction Company, of Fairmont, W. Va., is prepared to accept bids for the construction of 17 miles of track. Arthur L. Linn, Jr., is general manager.

THE MAY MEETING OF THE INDIANA ELECTRIC RAILWAY ASSOCIATION

The May meeting of the Indiana Electric Railway Association was held on May 11 in Terminal Station Hall, Indianapolis, President C. L. Henry presiding. About fifty members were present. The chief topic for discussion was "Repairs of Car Equipments," and was introduced by a very able and interesting paper by M. M. Nash, master mechanic of the Terre Haute Traction & Light Company. This was a live subject and Mr. Nash was complimented very highly for the able manner in which he presented the matter. Among other things, he said the subject is one of great interest and importance to the welfare of electric lines, inasmuch as the successful operation depends, to a very large extent, upon the repair department. At the head of this department should be a man who thoroughly understands his business, practicing economy in every possible way, but not neglecting or slighting any part of the work, as it is poor economy to slight the repairs to electrical equipment. The master mechanic should be allowed to employ thoroughly competent men and to lay out the work, that individuals can be held responsible for special classes of work which they are set to do. He should be allowed to pay sufficient wages to command skilled mechanics, and under no circumstances be forced to take men into his department simply because they are friends or relatives of some official. As a rule, such men are inefficient and do not give proper attention to their work, or to handling it economically.

"Some managers are prone to criticise the expense of the repair department," said he. But regarding results to be obtained rather than first cost, he believes the very best labor and material obtainable proves cheapest in the long run, and the expense justified by the knowledge that on heavy days, when a company is obliged to put all of its cars into service, the schedule will be uninterrupted by break-downs, and the manager who is prone to criticise the expense account of the department is the first to congratulate himself and boast over the good condition of his equipment.

Mr. Nash related his experience with the first shop of which he was master mechanic. The company had for equipment of its cars the old type-F 30 and WP 30 motors, which the management was on the point of throwing out and replacing with a later design when he took hold of the repairs. At that time the shop force consisted of thirty-nine men, all of whom were necessary to look after the repairs on thirty-four cars, and while these men worked hard day and night, there were always from five to ten cars lying idle in the shop. This condition was due to the fact that the material used was the cheapest that could be bought and the work in the shop had not been systemized. Mr. Nash said he decided at once to secure better material and better assistance, and proceeded to do so. While the repair account consequently increased, in three months time, with the repair work systemized and with good material, the cars were always ready for service when wanted, and instead of thirty-nine men, fourteen efficient men did the work. It followed that after the cars were in good condition, the repair force organized and good material in the supply room, the expenses of the shop were reduced fully 50 per cent, and this emphasizes the adage that "What is worth doing at all is worth doing well," and that good material and an organized force systematically employed is productive of the best results with the least outlay.

The periodical inspection of cars, he said, is a great factor in economical maintenance, and this, he thought, should be done at least once a month. Such an inspection should include the controller circuit breakers, and the electric equipment as well as the mechanical. He advised that a complete record be kept of all work done upon a car and its equipment, and the cause of the trouble making such work necessary, so the operating officials can know at all times the condition of the equipment as a whole, the reasons for the repairs and the manner in which same are handled, thus enabling them to keep in touch with the operation of the repair shop and show at a glance what cars could with safety be put in service on call.

In order that these inspections may result beneficially, Mr. Nash believed it essential that special men be detailed to examine special parts, and that these men should be held responsible for the condition of these special parts. The man who looks after the trucks should not be the man to examine the air brakes, and the air-brake man should not be the one to examine the controllers and resistances. He also believed it economical to purchase armature coils of manufacturers, rather than attempting to make them in the company's own shops, as they are better formed, more carefully made and tested, easier to put in place and last longer.

Mr. Nash said that the method of lubricating the bearings had considerable relation to the cost of repairs to equipments. The life of the bearings depends largely upon the method of lubrication and the kind of lubricants used. He said oil which is fed into the bearings through a piece of felt, from an oil cup, gives satisfaction in increased life of bearings and consequent reduction in cost. Mr. Nash gave a brief but interesting description of the repair shop of the company with which he is connected, and concluded by saying that in order to secure the best results, not only constant attention, good material, proper equipment are required, but the services of a good master mechanic with skilful assistants are essential for the resulting economy and satisfactory condition of the equipment, and these will certainly justify the means.

Mr. Nash's paper provoked a discussion among the master mechanics and managers present in the nature of an "experience meeting," the members relating incidents in their work and putting questions to each other. Mr. Nash was asked if he had had much trouble because of the breaking of axles, and if so, what steps were taken in the way of inspection. Some companies are reported to be experiencing great trouble from broken axles. Mr. Nash replied that a year ago his company had had three axles break, but since adopting a careful method of inspection, whereby all worn axles were thrown out, less trouble had been experienced. The present plan is to discard the axle if a crack of any nature is found in it.

Mr. White asked about the plan of oiling journals, and said it had been their experience to some extent, in summer time, that the grease melts out in a short time, leaving the bearings in a dry condition, and thus liable to melt the metal. In winter time it is so hard the bearings have to heat in order to soften the grease. Mr. White said he had recently observed an automatic lubricator on a large type of locomotive. The oil is put into a reservoir, and when the locomotive is in motion the force feed-pump supplied the oil, a drop at a time, exactly when it was needed, and he was advised that a pint of oil served a larger mileage than by the old method of applying it. Mr. White insisted that this was an important question, and a little advice as to the best method of preserving high-speed bearings will go a long way.

Mr. Nash said in order to obtain good results the consistency of the oil should be changed from summer to winter, and also the kind of waste or felt used in the reservoir. When asked by President Henry how long he had been using the feed method, Mr. Nash replied that his company had been experimenting with different kinds of oils for about six months. C. A. Benn, of the Indianapolis & Eastern, explained the method of lubricating bearings on that line, and told how they had overcome some of the troubles named, and were now getting excellent results from the oil in use and the method of feeding. H. A. Nichol said he would like to ask Mr. Nash which he thinks the better policy, to keep cars outside or under roof in car houses. Mr. Nash replied that there was nothing gained by keeping cars outside except a little insurance, and he would advocate keeping cars under roof. It is a difficult matter to get work done properly on cars outside. Electric cars should always be under roof when not in service, and kept as warm in winter as possible. President Henry said he had been greatly impressed by Mr. Nash's paper and his ready answers to the questions asked him. On the question of repairs it seems that the way to have everything all right is to make absolutely sure of it.

The committee previously appointed to wrestle with the interchangeable mileage question made a preliminary report through Mr. White, the secretary. In effect, the report showed that the managers of the roads had been communicated with, and while a few expressed a willingness to adopt the plan, no line appeared to urge it, while a few opposed it. Therefore the committee had adopted a resolution to the effect that the matter be left to individual action for the present. Further consideration of the matter was deferred until the June meeting.

By the reading of a letter by Mr. Chipman, the question ot steam road competition was raised. From many parts of the Middle West information comes that the steam lines are cutting rates where trolley lines parallel them, and in some instances the steam lines have inaugurated hourly service with lower rates than those of the interurban.

A. A. Anderson, general manager of the Indianapolis & Cincinnati line, said he would like to know what becomes of the valuable and interesting papers read at the regular meetings. He said Mr. Nash's paper should be in the hands of every employee of the mechanical departments. Secretary White replied that he had preserved copies of these papers, and had already collected quite a compendium of cogent figures and data relating to the construction, operating, electrical and mechanical departments of electric railways—the labor of the brightest electrical engineers, mechanics and managers in the State. He also stated that the papers were published in the STREET RAILWAY JOURNAL, a publication deserving of large support by the Indiana lines and employees.

In the afternoon the members of the association were the guests of the Indianapolis, Columbus & Southern Traction Company. The "Flat Rock Special" carried the party to Edinburg, where the power plant was visited. To find a large starch plant operated in connection with the power plant by employing the exhaust steam was an interesting revelation. The trip from Edinburg to Columbus, the southern terminus of the line, was made over 9 miles of track as straight as a line and level as a floor. This stretch of superior road construction is Mr. Irwin's pride, and he is now offering a prize of $25 to the neighborhood that will decorate its shelter station and grounds with vines and blooming flowers the handsomest. This line parallels the J., M. & I. division of the Pennsylvania Railroad almost the entire distance of 42 miles. Seven substantial towns and cities, including two county seats, are on this line, and are about 6 miles apart. The farms are largely devoted to gardening and the production of peas, sweet corn and tomatoes to supply three or four large canning establishments on the line. Sugar Creek and Flat Rock River, the mecca for fishermen, are crossed at convenient points. This line is destined to become an important link in the connecting of Indianapolis and Louisville by trolley. The party was under the escort of Superintendent George A. Saylor and Special Agent Robert O. Boyer. On the return trip the party was joined by General Manager William G. Irwin. Mr. Irwin had just returned from a trip to Mexico, and he entertained the party by relating interesting observations and telling stories as only an interurban man can tell them.

The subject for the June meeting will be "Train Despatching," and will be presented in separate papers by representatives of two companies which use different methods. A very interesting meeting is anticipated and one which will throw considerable light upon this important question.

INSPECTORS' AND SUPERINTENDENTS' MEETINGS IN BOSTON

One of the effective aids used by the transportation department of the Boston Elevated Railway Company for bringing its men and the management into closer contact is the practice of having regular meetings with the chief inspectors and with the division superintendents. It is thought that on smaller systems the superintendent may be able to keep in personal touch with the rank and file of the men, but on the large systems the management has to issue its orders to the men through an intermediary, and sometimes through two or three, and this calls for something akin to army regulations and discipline.

On the Boston Elevated Railway the meetings with division superintendents are held twice every month, on Thursday evenings from 7 to 9 o'clock, in the office of the superintendent of transportation. There are usually present, beside the superintendent of transportation, nine division superintendents, the superintendent of inspection, the superintendent of employment and the superintendent of time-tables. Not infrequently the vice-president and his assistant are present, and sometimes the president attends the meetings. The superintendent of transportation usually takes up the first hour with a general talk on some pertinent subject relative to the superintendents' duties, methods of handling conductors and motormen, or conditions of traffic. The second hour is given over to general discussion by those present, when questions are asked and answered and information given relative to the service and methods of improving it. On occasions one superintendent is designated to read a paper, and this paper forms the subject for discussion during the evening.

In addition to the superintendents' meetings the superintendent of transportation holds monthly meetings, at which all the inspectors on the system are expected to be present. These are held on the first Tuesday evening in each month and are usually attended by from fifteen to twenty-five of the company's inspectors. As at the division superintendents' meetings, the superintendent of transportation occupies the first hour in a general talk, and then follows an hour of discussion. At both these meetings a stenographer is present and a verbatim report of the discussions is typewritten and sent to all interested for filing.

The division superintendents in turn hold regular meetings with the men under them, and thus the instructions and discussions are passed to the rank and file of the men.

BOSTON & NORTHERN STREET RAILWAY ENTERTAINS NEWSPAPER MEN

With General Passenger Agent Robert H. Derrah and Superintendent Thomas Lees, of Division 2 of the Boston & Northern Street Railway Company, as the hosts, a party of newspaper men, representing the publications of Nashau, Lowell, Lawrence and Haverhill, enjoyed a trip through the beautiful Merrimac Valley from Lowell to Newburyport on Sunday, May 7. The trip was made in an elaborately appointed observation parlor car, which took the Lowell and Nashua contingents on board in Lowell at 9:30 o'clock. In all about 80 miles were covered by the trip, and of this distance only 9 miles, the distance between Lawrence and Lowell, was covered over the same rail. The return trip was made by way of Amesbury and Merrimac to Haverhill and Bradford, North Andover and Andover to Lawrence. The car finally reached Lowell at exactly 8 o'clock. En route the comfort of the guests was looked after by Mr. Derrah and Superintendent Lees. A light lunch was served on the car. At Newburyport an elaborate dinner was partaken of by the party.

THE QUESTION BOX

Under the heading line department are described this week a novel wire cradle for catching broken high-tension wires; and also an interesting method of setting trolley poles. In the track department is described an ingenious tool box used by the Detroit United Railway for carrying track tools, lamps, etc.

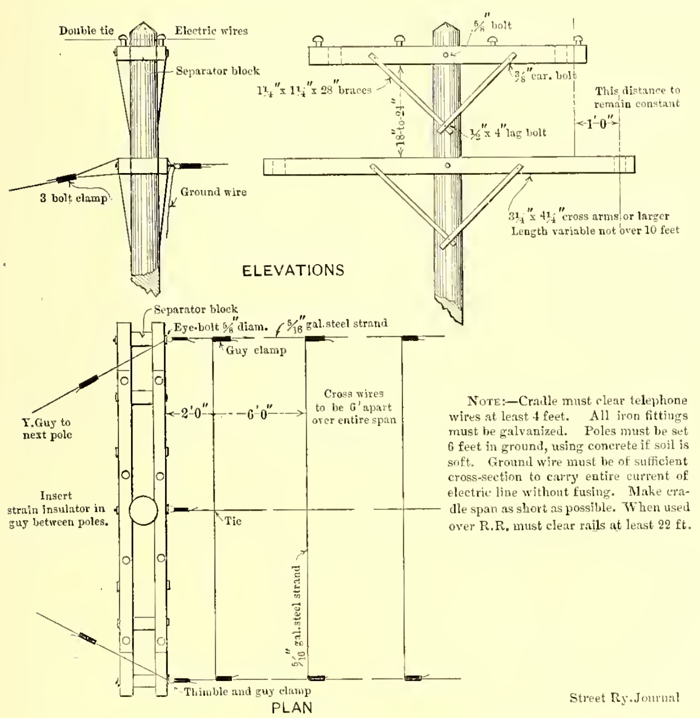
H.—LINE DEPARTMENT

H 4.—What is the best form of cradle or other device for catching broken high-tension lines at highway crossings, or where the lines cross over or under other wires?

Ordinary stock fence wire about 6 ft. wide grounded on both sides makes a very efficient cradle.

Columbus, Buckeye Lake & Newark Tract. Co. and Columbus, Newark & Zanesville Elec. Ry. Co.

A guard-wire cradle for use under high-tension wires where they cross other wires or highways may be constructed of galvanized steel strand in the manner shown in the accompanying sketch. If, in case of breakage of one of the high-tension wires, it is not desired to ground the same, cross wires may be omitted and hard wood strips substituted therefor. Hard-drawn copper should be used for the cradle at crossings over steam railroads, owing to



GUARD WIRE CRADLE FOR HIGH-TENSION WIRES

the corrosive action of the locomotive fuel gases upon the steel strand. However, copper wire is not advised for other or general use on account of its susceptibility to fracture at the ties. A good ground can be made by running a steel strand from the cradle to the ground and soldering it to a sheet of copper at least 2 ft. square, buried in the ground several feet. About a bushel of charcoal should be placed around the copper plate to insure a retention of moisture in the surrounding soil. This copper ground should be located some distance away from the base of the pole so as to keep the excess of moisture from the pole butt.

BERT H. SHEPARD, Constr. Engr., Black River, N. Y.

H 9.—What is the best way to raise and set trolley poles? Give sketch or photographs and description of method; also detailed cost of doing the work.

For city work, where there is a lot of pole work, use a wagon with a derrick on it.

Columbus, Buckeye Lake & Newark Tract. Co. and Columbus, Newark & Zanesville Elec. Ry. Co.

With trolley poles of less than 40 ft. in length use ordinary pike poles with dead man. The cost of setting 25-ft. to 40-ft. poles varies from 75 cents to $2 per pole in sand, and from $3 to $6 per pole in rock or hard pan, when blasting is required.

H. A. TIEMANN, New York City.

To set poles properly and expeditiously it is essential that experienced men be employed. The poles most generally used in electric railway work vary in length from 28 ft. to 40 ft., and for such poles the raising gang should consist of eight men. The hole should first be trenched about 2 ft. in the direction from which the pole is to be raised, and from 6 ins to 12 ins., the exact distance depending upon the nature of the ground. The pole should be placed with the butt over the hole. Crooked poles should be placed with the bulge uppermost, so they will not turn after being raised from the ground. One man should be stationed at the hole with a long bar, against which the butt of the pole will rest, and on which it will slide smoothly into the hole when the pole is raised from the ground. The men then take their places alongside the pole, near the top, and raise it to their shoulders, the pikers arranging themselves, one on each side and one in the center. The center piker and the ground men following up the pole do most of the lifting, the side pikers serving to steady the pole. With very heavy poles a dead man of the mule pattern should be used to relieve the ground men of some of the weight. When the pole slides into the hole the pikers spread out so as to divide their distance evenly around the pole. The pole is now turned with a cant hook to face in the right direction, and is aligned both parallel and at right angles to the direction of the line. The ground men shovel in dirt and stones, tamping the filling solidly until the pole is "stuck," that is, is held so that it will stand without the aid of the pikes. Usually at this time the majority of the gang stand around while a few fill up the hole, as not more than one shoveler and two tampers can work around the pole without crowding. A great saving can be made by having three additional men to follow along and fill up the holes after the poles are "stuck," enabling the raising gang to proceed without so much delay. Cobble stones, crowded solidly between the base of the pole and the side of the hole and the spaces between them filled with earth, solidly tamped, make an excellent setting. Green sod, soft and brittle rocks, as well as large quantities of stone without an earth filling, should be avoided, as all of these work loose in a short time, allowing the pole to swing out of place when any strain is brought upon it. It is better to use only earth near the top of the hole, as generally the soil is more or less yielding at that point, causing stones to work loose.

The tools required for the foregoing work are as follows: One 8-ft. digging bar, one cant hook, one pair carrying hooks, one 12-ft. pike, two 14-ft. pikes, one long-handled spoon, two long-handled shovels, three iron shod wood tamping bars, and one iron tamping bar. A carpenter's level with a plumb attachment and having a small block attached to one edge is sometimes used to determine the proper rake of the poles; but generally the eye can be depended upon to align poles after the first one has been set.

It is advisable to have a separate gang large enough to dig as many holes in one day as there will be poles set. By starting the digging gang out one day ahead of the pole-raising gang they will always be ahead of the latter by one day's work. The holes will not have as much opportunity to fill with loose dirt and surface water as if dug for a longer time, and at the same time if particularly hard, stony holes are encountered there will not be the chance for delay or skipping which might occur if the holes were dug the same day and only as fast as the poles were set.

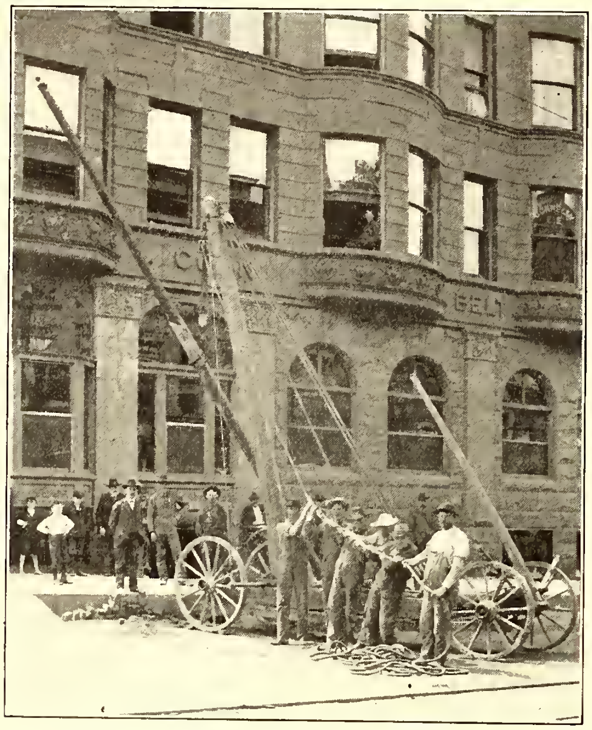
The cost of setting poles by the foregoing method may be taken as follows: A gang to consist of four linemen at $2.25, four groundmen at $1.50, and one foreman at $3.00 per day, making the expense for labor $18.00 per day. This force will set on an average forty poles per day, making the average cost for labor 45 cents per pole. With the three additional groundmen the labor cost would be increased to $22.50 per day, but such a gang can set sixty poles per day, bringing the average cost down to 37½ cents per pole. The cost of digging the holes will vary from 15 cents per hole in sandy soil to $1.50 in stony soil. In rock where blasting is necessary the cost is very uncertain, depending upon the nature of the rock and local conditions, but generally it will be from $2.00 to $4.00 per hole. It is generally cheaper to blast stony and frozen ground than to dig. To do this a hole about 3 ft. deep should be made with a digging bar, and a stick of dynamite inserted. Both the fuse and electric exploder are extensively used for discharging the dynamite. The writer prefers to use an electric exploder with about 200 ft. of lamp cord attached and two cells of ordinary dry battery. Connecting the lamp cord to the exploder and the positive of one cell and the negative of the other to the lamp cord, and then touching the other two terminals of the cells to each other, will explode the cap and discharge the dynamite. Lamp cord is used in place of bell wire because it has better insulation, does not kink so readily, and is more convenient to handle. The dry cells, aside from being cheaper than a magneto machine, are more convenient to carry around, and if damaged may be replaced at a small expense.

Poles can be delivered on the ground for about 10 cents each, where the haul is not more than 5 miles.

The total cost per pole for hauling, digging and setting will vary from 60 cents to $1.20, anything less than $1.00 being a good average for an entire line.

BERT H. SHEPARD, Constr. Engr., Black River, N. Y.

The accompanying engraving shows an inexpensive boom derrick, which was constructed for use on a small road where there



DERRICK FOR SETTING POLES

was less than 100 iron poles to set and a like number of wooden poles to remove. The iron poles weighed from 750 lbs. to 1300 lbs. each. The wooden poles removed were mostly 60-ft. poles.

C. H. ROBINSON, Master Mechanic, Bloomington (Ill.) Normal Ry., Elec. & Heating Co.

H 10.—What are the relative costs of various kinds of woods available for trolley poles? What is their relative length of life?

The relative life of a cedar pole is fifteen years and that of a chestnut pole is ten years.

Columbus, Buckeye Lake & Newark Tract. Co. and Columbus, Newark & Zanesville Elec. Ry. Co.

Chestnut, $3.00 per pole for 30-ft. pole, 7½-in. top, delivered; chestnut, $4.00 per pole for 35-ft. pole, 8-in. top, delivered; chestnut, $5.00 per pole for 40-ft. pole, 7½-in. top, delivered; cedar, $3.00 per pole for 30-ft. pole, 8-in. top, delivered; cedar, $3.50 per pole for 35-ft. pole, 8-in. top, delivered.

H. A. TIEMANN, New York City.

H 13.—What is the most efficient method of preventing short-circuits by reason of low-tension feeders coming in contact with trees?

Cover low-tension feeders with wooden moulding where they pass through trees. Mech. & Elec. Engr.

Where trees cannot be trimmed put rubber hose around feeders.

Columbus, Buckeye Lake & Newark Tract. Co. and Columbus, Newark & Zanesville Elec. Ry. Co.

Tree insulators. H. A. TIEMANN, New York City.

Use hard wood chafing gear fastened securely to cable, so that there can be no wear on insulation of fastening, wood to be boiled in paraffine and made waterproof.

FRANCIS G. DANIELL, New York City.

H 17.—When you receive a report from the car crew that a trolley wheel has jumped the wire, what action is taken?

Investigate the cause. If the overhead wire is defective repair it. If the line is in proper condition report it to the shop foreman, so that he can examine trolley pole and base.

Columbus, Buckeye Lake & Newark Tract. Co. and Columbus, Newark & Zanesville Elec. Ry. Co.

Examine trolley wire to see if it is out of line or bent; look for improperly placed ear, etc. H. A. TIEMANN, New York City.

If the car first reporting trolley wheel jumping is not followed with like report by next car, we have extra trolley pole, or wheel and fork, ready for car on its return; if second or third car report same trouble, lineman is at once sent to point of trouble.

L. M. LEVINSON, Mgr., Shreveport (La.) Tract. Co.

H 19.—What are the relative advantages and disadvantages of the tower wagon and the tower car for making repairs in overhead construction? Do you prefer the wagon or the car?

For ordinary city work it does not seem practical to use a car in making repairs to overhead construction, but for suburban lines the car has great advantage in speed, provided that the trouble can be cleared sufficiently to allow the car on the line. The car also has advantage in that the men have more room to work than on the tower wagon. There are some troubles, such as the grounded feeder that make it impossible to use the car.

Mech. & Elec. Engr.

A tower wagon has the advantage over a car in the city that it can get to poles or to any part of the work without interfering with the car service.

Columbus, Buckeye Lake & Newark Tract. Co. and Columbus, Newark & Zanesville Elec. Ry. Co.

Tower wagon, because it does not interfere with traffic. In case of a new line a car is preferable, as reels of wire can be mounted on it and trolley wire can be fed out as the car moves along.

H. A. TIEMANN, New York City.

A wagon can get off track and let cars by, but cannot travel long distances as rapidly as a car, and on a private right of way there are often drains, etc., which horses cannot cross.

FRANCIS G. DANIELL, New York City.

The advantage of the wagon is in quicker service in the city, while with the car we are able to reach overhead work on elevations and trestles, and on situations where a wagon is not available. For a long-distance run the tower car is best suited.

L. M. LEVINSON, Mgr., Shreveport (La.) Tract. Co.

A.—GENERAL

A 1.—What various methods do you employ for advertising your road and its attractions?

We reserve the end spaces in cars for advertising our own special rides or attractions, and also employ cloth banners, about 16 ft. x 3 ft., on sides of cars to advertise special attractions, etc. We find that with these two methods the best results are obtained, as we reach the public through the street car itself better than through any other channel, and our expenses for advertising are very light.

DENVER CITY TRAMWAY CO.

A 3.—How much money can be spent profitably by an electric railway company for advertising?

Depends entirely upon local conditions. We find it much easier to spend money in advertising in the newspapers than to recover it.

DENVER CITY TRAMWAY CO.

A 4.—What are some of the ways by which an electric railway company can kindle and foster a more kindly feeling and a fairer treatment on the part of the public press of its community?

The best way to foster the good feeling of the public is to encourage the employees to be uniformly polite and courteous. We use the "merit system" of discipline, and all inspectors, secret and otherwise, are constantly on the alert, and all cases of politeness and courtesy on the part of employees are reported at the superintendent's office. At the end of the month the men are notified of certain merit marks placed to their credit, as well as the demerits placed against their record for violation of the company's rules. We also believe that clean, well-lighted cars and as good a service as is possible to maintain, in accordance with the amount of traffic on the line, is one of the best ways to promote good feeling between company and public. DENVER CITY TRAMWAY CO.

A 35a.—Can a fifteen-minute service be successfully given upon a single-track interurban road? What conditions are necessary to make this possible?

I think not. The headway is entirely too short for a successful service, as the least delay to any one car will immediately throw the rest of the cars late, and unless you have very easy running time your cars are bound to run late for the rest of the day and continue to get later.

DESPATCHER.

A 36a.—Based upon experience, what is a proper rate per mile for interurban passenger business, and to what extent should these rates be reduced by the sale of commutation tickets, monthly tickets, coupon books, etc.?

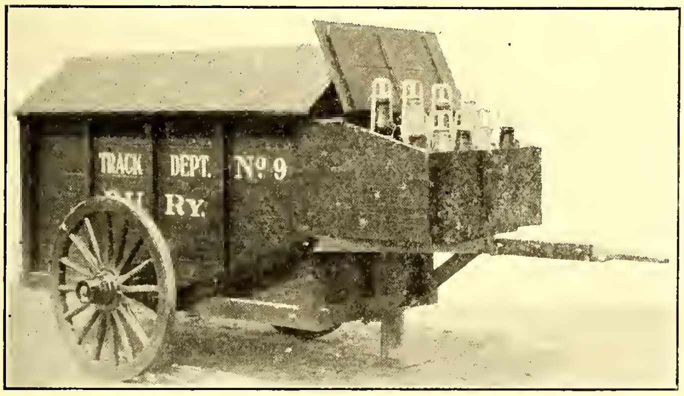
We believe the proper rate per mile for interurban passenger business should be two-thirds of steam railroad rates; mileage tickets one-half of steam railroad rates; no other concessions made.

A. L. NEEREAMER, Traffic Mgr.,
Columbus (Ohio), Delaware & Marion Ry. Co.

A 49.—Information is requested relative to best despatching systems for interurban roads.

(a) What is the proper method of numbering trains?

Trains should be numbered consecutively, commencing with No. 1 as the first train leaving the car house in the morning to and including the last train leaving the car house in the evening. South and westbound trains should bear odd numbers; north and eastbound trains the even numbers.



TOOL BOX, SHOWING LAMP COMPARTMENT

A. L. NEEREAMER, Traffic Mgr.,
Columbus (Ohio), Delaware & Marion Ry. Co.

We assign odd numbers to northbound trains, the first train out in the morning being No. 1, the second No. 3, and so on. The first southbound train is No. 2, the second No. 4, and so on.

DESPATCHER.

(b) Should odd and even numbers be used for opposing trains?

Yes, the train number signifies immediately the direction in which the car is going.

DESPATCHER.

(c) How are train numbers changed at the end of the run?

A train turning at a terminal point takes the next number, odd or even, according to the numbers given to specify leaving time, regardless of the number of the car.

A. L. NEEREAMER, Traffic Mgr.,
Columbus (Ohio), Delaware & Marion Ry. Co.

On our road when a train pulls into its terminal station the train is through for that day, and so the train number corresponding is also finished.

DESPATCHER.

A 50.—Please describe a simple board for despatcher's use, showing location of all trains at all times.

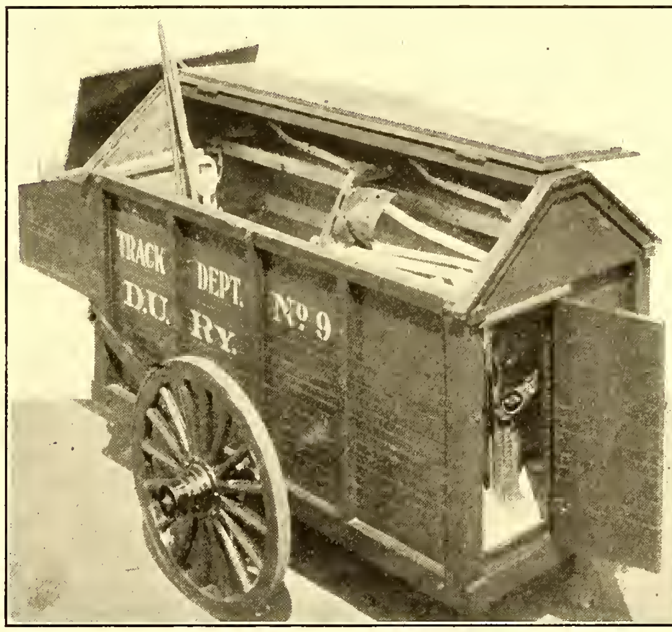
We use the regulation steam railroad despatcher's train sheet, which is considered the simplest form.

A. L. NEEREAMER, Traffic Mgr.,
Columbus (Ohio), Delaware & Marion Ry. Co.

I.—TRACK DEPARTMENT

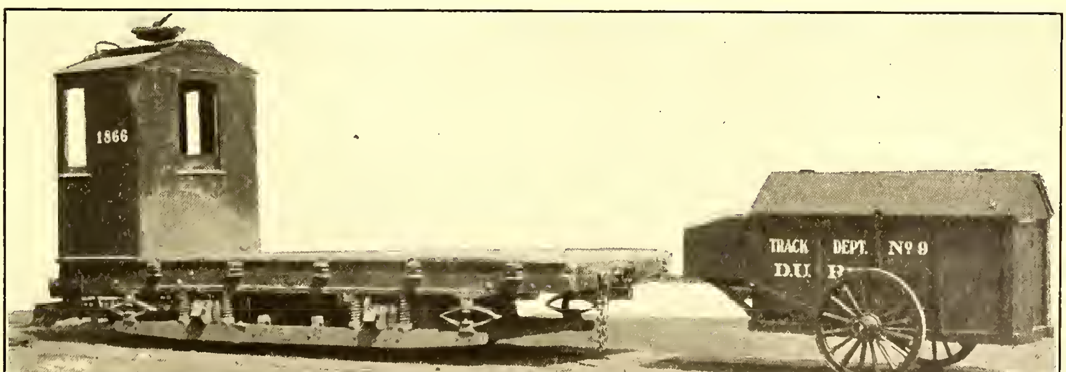
I 9a.—What means or devices are you using for expediting or cheapening the work of the track department?

For expediting the work of the track department, the Detroit United Railway is using a novel form of portable box or wagon, designed for carrying a full complement of track tools. On the Detroit system all the track work is done with the aid of construction cars and no horse-drawn vehicles are employed by the track department. For this reason it was found advisable to have



TOOL BOX—DETROIT UNITED RAILWAY

tool boxes that could be coupled behind the construction cars or behind a regular car when the track gangs were moving from one job to another. To fill this need the form of box shown in the engravings has been devised. The body is carried on two wheels, which are made to fit the gage of the tracks, and it is fitted with a coupling bar, so that when there is considerable distance to be covered the wagon can be coupled to a car, or it can be hauled over short distances by the track men. At one end there is a compart-



TOOL BOX COUPLED TO CONSTRUCTION CAR

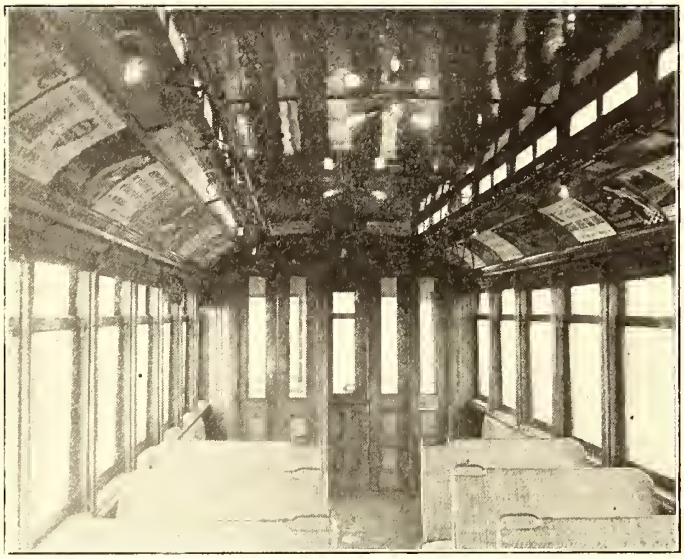
ment having room for six hand lanterns. At the other end is a small compartment for carrying track jacks. The main body of the box has racks and shelves on which shovels, picks and other track tools can be placed so they will not rattle around when the box is being moved. The company has had twelve of these tool boxes in use for about a year on the city lines in Detroit, and they have made a considerable saving in moving from one job to another.

JOHN KERWIN, Supt. of Tracks,
Detroit United Ry.

THE NEW DIVIDED PLATFORM AND DOUBLE-DOOR CAR ON THE MONTREAL STREET RAILWAY

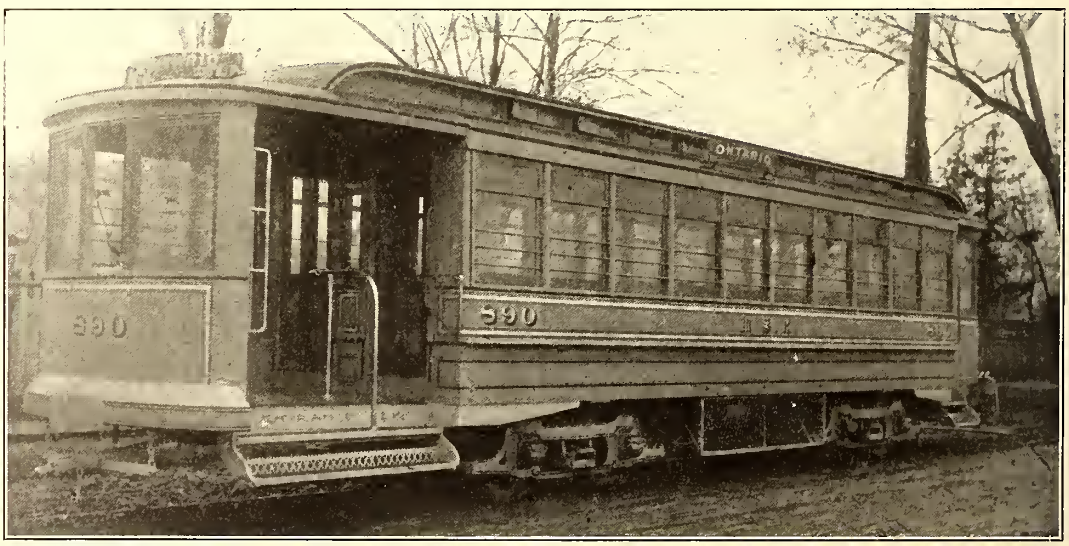
A new type of car, which it is hoped will greatly simplify the collection of fares and the handling of passengers, has just been placed in service on one of the important lines of the Montreal Street Railway. It was originated by W. G. Ross, the managing director, and Duncan McDonald, the manager of the Montreal Street Railway Company, who believe that it will prove especially valuable during periods of heavy traffic.

The new car, No. 890, is of the same general type as the last group constructed by the company, which have been in operation on the different lines for some time past. It is of the semi-convertible type, with seats as in the ordinary steam railway car. In place of a 5-ft. platform, the new car has one of 7-ft., and instead of the ordinary door placed in the center of the end, there are two doors, the brass railing leading up from the steps dividing the platform into two aisles.



A VIEW OF THE INTERIOR, ILLUSTRATING THE ARRANGEMENT OF THE ENTRANCE AND EXIT DOORS

One of these doors is to be utilized entirely by persons entering the car and the other solely by those who desire to leave. This is arranged and made arbitrary by the fact that while one of these doors opens inward only, the other opens only outward. When a passenger steps on the platform, which is amply large for a dozen or fifteen adults, he is met by the conductor, who demands a fare before allowing the passenger to proceed. The passenger then passes on through the entrance door into the car, from which he may make his exit at any time, either by the front entrance or by the rear door designed for the purpose.



THE NEW CAR USED BY THE MONTREAL STREET RAILWAY COMPANY, SHOWING THE GATE DIVIDING THE REAR PLATFORM INTO SECTIONS

The conductor, having no fares to collect from passengers in the car, can remain at his post on the platform, giving such attention as is necessary to the passengers getting on or off the car. The conductor is also provided with a receptacle into which the fare box fits so that he may, when necessary, have both hands free, and at the same time not miss the fares. As these cars are all provided with electric buttons as well as the usual signal cord, the passenger can easily and at all times make his desires known without having the conductor at his elbow.

Another improvement in the new design is the exit from the front platform. This portion of the car being more spacious than usual, not only gives the motorman ample room, but divides him from the rear portion of his platform by a brass railing. At the motorman's foot is a catch which when released by pressure throws open the door automatically, thus making it unnecessary for the man in charge of the motors to even raise his hand or turn his head.

In view of the fact that the majority of serious accidents on street cars happens at the back platform when the conductor is busy collecting fares inside the car and unable properly to gage stops and starts, the new design is considered most important. Again, the Montreal Street Railway, like many other surface roads, is now losing a large percentage of fares through the inability of conductors to tell who has paid and who has not. Another feature is that, in order to operate the system properly, large crowds cannot be taken on without tedious waits on the platform or at the foot of the steps before the platform is reached. In fact, the success of the idea lies primarily in the ability of the conductor to gage his crowds properly and handle them quickly.

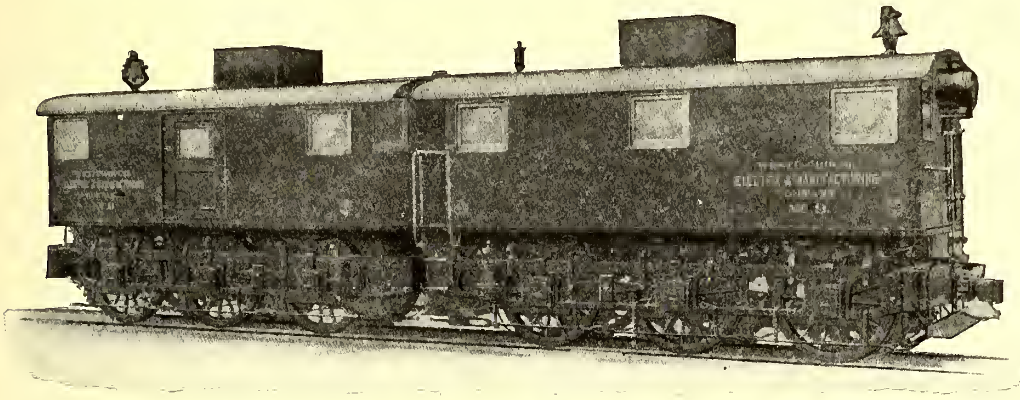
MENAGERIE ATTRACTIONS FOR RAILWAY PARKS

That a good collection of rare birds and beasts can be made an excellent attraction for summer parks goes without saying, but very few park managements can afford to purchase outright a lot of expensive animals. Besides, the care of such an attraction requires the attention of a good naturalist who can give the park employees the proper instructions to be followed in looking after the inhabitants of the menagerie.

To enable the average railway park to add to its attractions a feature of this character at minimum expense, Dr. Cecil French, the well-known Washington naturalist, is prepared to rent almost any desired animals, or, as he expresses it, "Anything from a white mouse to a white elephant." In his capacity as American agent for the zoological parks of Berlin, Hamburg and Antwerp, Dr. French has acquired an intimate knowledge of the offerings in this market. Among the animals that he is prepared to loan or sell are swans, geese, ducks, cranes, elk, beavers, deer, rabbits, seals and sea lions.

1500-H. P. SINGLE-PHASE LOCOMOTIVE

During the visit of the delegates to the International Railway Congress at the Westinghouse works at Pittsburg, May 16, a great deal of interest was attracted to the new 1500-hp Baldwin-Westinghouse single-phase alternating-current electric locomotive in use on the Westinghouse Interworks Railway. This locomotive has just been completed by the Westinghouse Company and Baldwin Locomotive Works, and is in two parts, connected and controlled by the unit-switch system. The weight of the locomotive complete (both halves) is 135 tons, and the total length over bumpers is 45 ft. The maximum height with trolley down is 17 ft. The drivers are 60 ins. in diameter, and the distance between centers of drivers is 6 ft. 4 ins. The extreme width of the locomotive is 9 ft. 8 ins.



SINGLE-PHASE LOCOMOTIVE ON THE WESTINGHOUSE INTERWORKS RAILWAY

The locomotive is equipped with six single-phase, single-reduction motors, having a normal capacity of 225 hp each, with gear reduction of 18:95. Induction regulator control is used with a pneumatically-operated trolley. The air-brake equipment is combined automatic and straight air, with pneumatic sanders to sand tracks in both directions.

The locomotive is designed to operate on 6600 volts trolley voltage, with a voltage of 140 to 320 on the motors. The locomotive has a draw-bar pull of 50,000 lbs., at a speed of approximately 10 m.p.h. The maximum speed for which the locomotive is designed is approximately 25 m.p.h. to 30 m.p.h. Further particulars will be published in an early issue.

POWER STATION IN AN EARTHQUAKE

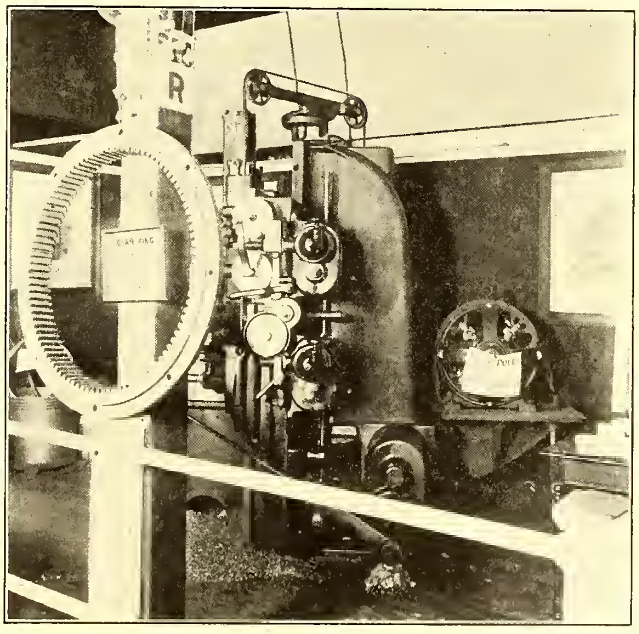
The new power station of the Manila Railway & Lighting Company, which has just been completed by J. G. White & Company, and which was described in a recent issue, has passed through its first earthquake. The shock was distinctly felt throughout the city of Manila, but no damage was done to the power station, although considerable anxiety was felt regarding its action on the 175-ft. stack. On the completion of the brick lining of the stack it was found that there was a longitudinal crack not over 1-32 in. in the curtain wall immediately back of the stack, due probably to a slight settlement of the stack. The earthquake did not appreciably change this crack.

The Philadelphia & Willow Grove Street Railway has issued a neat descriptive folder, including a bird's-eye view of Willow Grove Park, telling of the excellent attractions to be presented during the park season. Six high-class musical organizations will succeed each other at this beautiful park in drawing visitors, in addition to which there will be such attractions as a scenic railway, mirror maze, flying machine, Ye Olde Mill, coal mine, merry-go-rounds, etc.

ELECTRIC MACHINE-TOOL DRIVING AT WASHINGTON

One of the features of the exhibit of railway appliances at the International Railway Congress, at Washington, D. C., was the space and attention given to exhibits of electric drive for machine tools. While the steam railroads of this country have been slow about adopting electricity for traction purposes, a great many of them have employed this power for their repair shop work, and instances of electrically-driven shops are very common among steam railroad companies. Two interesting applications of electric motor to machine drive, made in the Westinghouse exhibit, were illustrated last week, and the accompanying engraving shows another tool which attracted a great deal of attention at Washington. It consists of an inter-pole motor, manufactured by the Electro-Dynamic Company, of Bayonne, N. J., applied to driving a 36-in. Bullard vertical turret lathe. The motor is of 10 hp and is operated at from 630 r. p. m. to 1260 r. p. m., giving a speed ratio of 2:1. In addition, the lathe itself had twenty variations in speed between these limits, giving any speed desired.

Besides the lathe described, the Electro-Dynamic Company had a variety of other motors both in operation in other exhibits and under test in the company's own space. The motors on exhibit covered 123 varieties, and the fact that the speed could be set at almost any point between very wide limits and that a practically constant speed would be maintained under varying loads at this point attracted very wide attention. In the case of two motors, which were under test in the space of the company, the motors were made to reverse under load, and their non-sparking running evinced under these conditions and under all loads was remarkable.



INTER-POLE MOTOR DRIVING 36-IN. VERTICAL TURRET LATHE

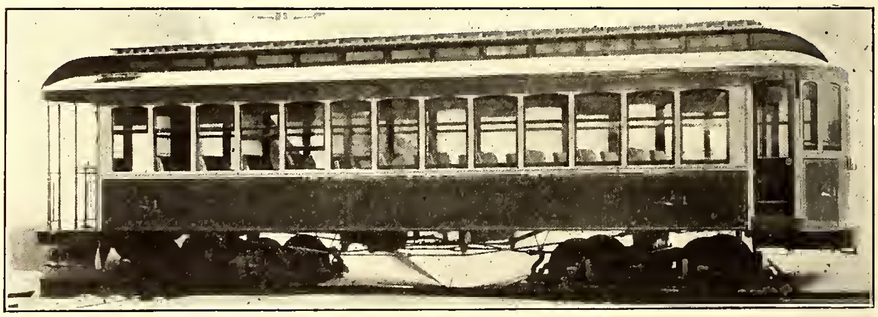
In the month of April last the earnings of the Metropolitan Division of the Toronto & York Radial Railway for the carrying of express and freight were 123 per cent in excess of the amount earned in April, 1904.

ROLLING STOCK FOR THE WASHINGTON, ALEXANDRIA & MT. VERNON RAILWAY

Four handsome interurban cars built by the J. G. Brill Company have recently been delivered to the Washington, Alexandria & Mt. Vernon Railway Company, Washington, D. C. They will be placed in operation on the company's lines commencing at Thirteenth Street and Pennsylvania Avenue, which is the center of the hotel and the traffic districts of the city, and crossing the Potomac River by what is known as the long bridge of the Pennsylvania Railroad. The lines pass the main entrance to Arlington Cemetery, go through Alexandria and continue along the shore of the Potomac to Mt. Vernon. The traffic between Alexandria and Washington has largely increased of late years and crowds of sightseers are carried daily to Arlington.

INTERIOR OF INTERURBAN CAR FOR THE WASHINGTON, ALEXANDRIA & MT. VERNON RAILWAY

The cars are 33 ft. over the end panels and 8 ft. 3 ins. wide over the sheathing. The roof and straight sides follow steam car construction. The window arrangement provides for the lower sash to be raised clear of the upper, where it is held by a balance mechanism and protected by weather strips set in felt, while the upper sash is stationary. The cars are seated for fifty-two passengers, the seats being transversely placed. The interior finish of cherry, stained mahogany, and the tastefully decorated light green ceilings, together with the rich dark green leather, in which the seats are upholstered, present a luxurious appearance that will be a source of pleasure to the passengers. At the forward end of cars are single swing doors, while at the rear the doors are arranged to slide. It will be noticed that the motorman's compartment is unusually small. While giving him ample space to work in, this arrangement prevents any interference with the motorman and gives more room inside the car.



INTERURBAN TYPE OF CAR FOR SERVICE IN AND ABOUT WASHINGTON, D. C.

The illustration of the interior shows an unusual feature in the construction of the forward end of the car. Instead of the usual large sashes, the ends are paneled to a height of 4 ft. from the floor, and above these panels sashes 10 ins. high are inserted; the single swing door at this end has a plate mirror on the inside. The reason for this arrangement is that the light from the car at night is excluded in a large part from the platform. It will be noticed also that the backs of the seats at these ends are against the paneling; therefore, the small windows may be opened without the draft from them blowing directly upon the passenger occupying these seats. The platform is enclosed with round end vestibule sheathing on outside, with steel sheathing to extend all the way round on one side without doors or gate, while on the other side is a small door and a step. The rear platform has a railing. On the forward trucks are removable ice diggers.

The general dimensions of the cars are as follows: Length over the crown pieces, 41 ft. 9 ins.; panel over the crown piece at the front, 3 ft. 9 ins., and at the rear, 5 ft.; width over the sills and the sheathing, 8 ft. 3 ins.; centers of the posts, 2 ft. 5 ins.; cross joists, 4½ ins. x 5½ ins.; side sill size, 4 ins. x 7¾ ins.; end sill size, 5¼ ins. x 6⅞ ins.; sill plates, ⅜ in. x 15 ins.; thickness of the corner posts, 3⅝ ins., and of the side posts, 2¾ ins. The cars are mounted on No. 27-E trucks for high-speed service, with a wheel base of 6 ft. and 33-in. wheels.

SCHOOL TERM ENDS AT SCHENECTADY

A notable example of the interest of the officials of the Schenectady Railway Company in the welfare of the men is the support which they give the Schenectady Railway Benefit Association, an organization to which nearly all the men belong. During the past winter a night school has been conducted under the auspices of the association, and Tuesday evening, May 9, the closing exercises of the classes for the season were held in the rooms in the Fuller Street car houses. A most entertaining programme was rendered and nearly all the officials of the company and employees were present, as well as many prominent citizens as guests.

Early last fall it was suggested by certain members of the Schenectady Railway Benefit Association that a night school would be a great advantage to the members of the organization. At a meeting of the board of trustees a committee of three, composed of C. C. Lewis, J. F. Hamilton and E. F. Peck, were appointed to carry on the work. It was decided to divide the work into two courses—one treating on electricity, as applied to a trolley car, and the other to mathematics. J. G. Baukat, engineer and master mechanic of the Schenectady Railway Company, very kindly offered his services as instructor of the electrical course, and R. H. Read, of the General Electric Company, was employed as instructor in mathematics. Sixteen joined the electrical course and 11 the mathematical.

At the close of the term competitive examinations were held, based on the subject studied during the school year. The two prizes which were offered for good scholarship were won by Ernest Huston and O. A. La Point, who stood first and second, respectively. So successful was the school that General Manager Peck says the work will be continued next winter.

NEW YORK STATE CONVENTION NEXT MONTH

At a meeting of the executive committee of the New York State Street Railway Association, held May 17, in Elmira, it was decided to hold the convention on June 27 and 28 at Lake George, the headquarters to be at the Fort William Henry Hotel. Messrs. Colvin and Peck were appointed as the entertainment committee.

FINANCIAL INTELLIGENCE

Wall Street, May 17, 1905.

The Money Market

Greater ease developed in all branches of the money market this week, rates for some maturities declining rather sharply, despite the loss of over $2,000,000 in the surplus reserve of the banks, and the return of about $6,000,000 Government funds by the local institutions, being the balance of the 25 per cent of deposits due under the recent call of the Secretary of the Treasury. A feature of the week was the decided ease in the call money department. The inquiries for demand money were unusually active throughout, borrowers in many instances being inclined to pay off maturing short-time contracts and take their chances in the call loan department at the prevailing low rates. The supply was abundant, at rates ranging from 2½ per cent to 2 per cent, as against 3 to 2½ per cent in the preceding week. In the time loan department a very moderate volume of business was reported. Sixty and ninety day maturities were offered with freedom at 3 per cent, a decline of ¼ per cent, while four months funds were obtainable at 3¼ per cent as against 3½ per cent, the ruling rate at the close of last week. For six months contracts, however, lenders positively declined to make the slightest concession. Some bids were in the market at 3⅜ per cent, but the banks refused to put out their funds at less than 3½ per cent. There was a good demand for over the year money, but borrowers and lenders were unable to agree on terms. Commercial paper was quiet and practically unchanged as to rates. Some exceptionally good paper was discounted as low as 3½ per cent. The bank statement was disappointing. Loans increased $7,595,000, despite the inactivity in the securities market. There was a decrease in cash of $436,400. Deposits increased $6,321,800. The reserve required was $1,580,450 larger than in the previous week, which, together with the loss in cash, resulted in a decrease in the surplus reserve of $2,016,800. The surplus now is $16,712,575, as against $12,827,250 in 1904, $8,992,625 in 1903, $8,346,525 in 1902, $13,299,925 in 1901, and $16,555,225 in 1900. There was nothing in the situation at the close to indicate any material change in the market in the immediate future. Sterling Exchange rules firm at 486¾ for demand, or a full cent below the point at which gold can be exported at a profit. On May 25 the final payment on account of the new Japanese bonds becomes due, but this transaction will tend to increase the supply of cash rather than to diminish it. In addition, the movement of currency is likely to continue in this direction up to the middle of July, when the interior banks will begin to prepare for the crop-moving requirements. The foreign markets continued easy, rates at all the principal European centers ruling practically unchanged. At London the discount rate closed at 2¼ per cent, at Paris 1½ per cent, and at Berlin 2¼ per cent.

The Stock Market

There was a further shrinkage in the volume of business on the Stock Exchange this week, and although prices developed some irregularity, the general tone of the market was decidedly better. In the early dealings there was a lack of outside interest, and trading was largely of a professional character. At the opening, prices ruled fractionally lower, being influenced to some extent by selling for London account. In the later dealings, however, the market became decidedly firmer. Reports of railway gross earnings were generally favorable, and the increasing ease in the local money market, despite the heavy payments by the banks, imparted a more cheerful sentiment. Under the lead of Northern Securities on the curb, prices advanced sharply. Heavy gains were recorded in Northern Pacific and Great Northern preferred, and Union Pacific also rose sharply in sympathy. Later in the week the strength in these issues was communicated to St. Paul, which developed increased activity on the advance. At the close of last week, however, there was considerable realizing, which carried prices to ½ to 2 per cent. At the beginning of the present week, the upward movement was resumed, but the advancing tendency failed to stimulate public interest. Commission house business was quite small. There was no great pressure to sell stocks, however, which made it easy for the pools to take up their respective issues. The feature of the late trading was the further rise in Northern Pacific and Great Northern preferred, both of which established new high records for the movement. St. Paul and Union Pacific were also conspicuously strong. In the industrial list Consolidated Gas and People's Gas were exceptionally strong. The Steel stock recovered all of the early losses, and Tennessee coal made a substantial net gain. At the close the market developed heavier. Sentiment being influenced somewhat by the report that Germany had seized a Chinese port, which might result in further complication in the Far Eastern question. The losses, however, were generally insignificant. The bond market was more active than in the preceding week, and prices for nearly all of the standard issues showed decided strength. The local traction issue displayed marked weakness in the early dealings, in anticipation of an adverse ruling in the franchise tax decision. The delay in handing down the decision, however, resulted in substantial recoveries, Brooklyn Rapid Transit scoring an extreme gain of 3⅛ and retaining nearly all of it.

Philadelphia

There was a further sharp falling off in the dealings in street railway issues this week, and although prices continued to show an irregular tendency, the final prices were, in most instances, substantially higher than those prevailing at the close of the previous week. Interest again centered largely in United Gas & Improvement, which fluctuated sharply on a moderate volume of business. At the opening the stock displayed some firmness, being influenced largely by continued good buying. In the later dealings, however, the price ran off from 116¾ to 112½, on the announcement that a local banking firm had made a bid for the lease of the city gas works now operated by the company. In the subsequent dealings there was heavy buying, on the belief that the bid would be declined by the City Council, and which resulted in a sharp advance to 117¾. At the close, profit-taking sales caused a reaction to 116⅛, a net loss for the week of ⅝. Upwards of 23,000 shares were traded in. Philadelphia Rapid Transit was a conspicuously strong feature, the price advancing 2⅛ points to 34⅛ on the exchange of about 10,000 shares. Philadelphia Company common was strong also, about 3000 shares selling at from 43¾ up to 44⅞, the closing being at 44⅜, a net gain of ⅞. Other transactions were: American Railways from 52 to 51¼, Indianapolis Street Railway at 110, United Companies of New Jersey at 271½ to 272, Union Traction at 60¾ to 61½, Railways General at 3, Consolidated Traction of New Jersey at 82 to 83½, and United Traction of Pittsburg preferred at 51.

Chicago

Dealings in the local street railway stocks continued upon an extremely small scale, but prices generally held strong. Metropolitan Elevated issues were especially strong, both the common and preferred advancing a point each to 23 and 63, respectively, on purchases of odd lots. Chicago & Oak Park preferred sold at 20, and 150 South Side Elevated brought 93. Union Traction sold at 7¼ to 7⅜ for 200 shares. North Chicago sold at 76, and West Chicago at 46.

Other Traction Securities

In the Baltimore market trading was considerably less animated. The United Railway issues, which have been the market leaders for weeks past, were extremely dull, while in other quarters of the market business was practically at a standstill. Prices, however, held generally firm. About $50,000 United Railway 4s changed hands, at from 92⅛ to 92¾, the final transaction taking place at 92⅜, while $35,000 of the incomes brought prices ranging from 60 to 59½. Other transactions included $4,000 Washington City & Suburban 5s at 106½, $9,000 Knoxville Traction 5s at 104, $2,000 City Passenger Railway 5s at 104½, $1,000 Lexington Street Railway 5s at 105, $2,000 Macon Railway & Light 5s at 99½ to 99¼, $2,000 City & Suburban 5s at 114¾, and $1,000 Norfolk Railway & Light 5s at 92¼.

Little interest was manifested in the Boston market. Trading was light and price changes were confined to the small fractions. Boston Elevated sold to the extent of a few hundred shares at 157 to 157½. Boston & Worcester common sold at 32¾ and 32 for odd lots, while the preferred changed hands at 79½ to 79. Massachusetts Electric common sold at 17½, and the preferred at 65. West End common declined from 96⅜ to 95¼, but subsequently recovered to 96. The preferred sold at 116½ to 116, and one $1,000 4½ per cent bond brought 105¾.

The feature of the New York curb market has been the pronounced strength in New Orleans Railway stocks, due to the continued absorbtion by strong interests. Of the common about 4000 shares changed hands at from 29¼ to 35, a net gain of 5½ points. The preferred, on transactions aggregating about 2000 shares, advanced from 77 to 78⅝. Interborough Rapid Transit was comparatively quiet. Opening at 202½ it dropped to 201, and subsequently advanced to 206, the final transaction taking place at 205, an advance of 2½ points. About 3000 shares were traded in. Brooklyn City Railroad sold at 239 for 100 shares. In the bond department transactions included $3,000 Washington Railway 4s at 90¼, $30,000 North Jersey Street Railway 4s at 78 and interest, $45,000 Jersey City, Hoboken & Paterson 4s at 77½ to 77¾, $50,000 Public Service Corporation 5 per cent notes at 97⅝ and interest, and $30,000 Public Service certificates at 70¾.

Toledo Railway & Light stock was especially active at Cincinnati last week, showing an advance from 32½ to 33¾. Cincinnati, Dayton & Toledo was practically stationary at 23¾, but was in good demand. Cincinnati Street Railway was inactive at 148, a fractional decline from recent prices. Detroit United had a range of 82⅜ to 87, and closed the week at the latter figure, the increase being in sympathy with New York, on a report of a prospective increase in dividends. Cincinnati, Dayton & Toledo 5s sold strong at 92½.

Aurora, Elgin & Chicago issues have enjoyed much attention at Cleveland during the past few days. The preferred stock has made a gain of 30 points in the last few weeks, and now stands 71½. The common was very active, and has moved up during the past few days from 15 to 18, and there has been much speculation in this issue on future deliveries. The 5 per cent bonds were active around 91½. Northern Ohio Traction & Light has been very active, and reached a high mark on this movement of 22¾. Cleveland & Southwestern preferred sold at 55, Northern Texas Traction at 57, Muncie, Hartford & Fort Wayne at 48, Cleveland Electric at 78½, and Western Ohio receipts at 14. In sympathy with New York, Detroit United moved up to 89⅜, a gain of 5⅜ points in three days.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	May 10	May 17
American Railways	51½	51
Boston Elevated	156½	157½
Brooklyn Rapid Transit	60¼	61⅝
Chicago City	—	a195
Chicago Union Traction (common)	7	6⅞
Chicago Union Traction (preferred)	—	—
Cleveland Electric	—	83
Consolidated Traction of New Jersey	82	—
Consolidated Traction of New Jersey 5s	109	109
Detroit United	82⅝	88
Interborough Rapid Transit	202	204¼
International Traction of Buffalo	25	25
International Traction of Buffalo (preferred)	62	a64½
International Traction of Buffalo 4s	82	82½
Manhattan Railway	164¾	164½
Massachusetts Electric Cos. (common)	17	16¼
Massachusetts Electric Cos. (preferred)	64	65
Metropolitan Elevated, Chicago (common)	21	21
Metropolitan Elevated, Chicago (preferred)	60	60
Metropolitan Street	116	116
Metropolitan Securities	77	76⅛
New Orleans Railways (common), W. I	29	35⅛
New Orleans Railways (preferred), W. I	75	79⅛
New Orleans Railways, 4½s	90½	91
North American	100⅝	100⅝
North Jersey Street Railway	—	25
Philadelphia Company (common)	43¾	43⅞
Philadelphia Rapid Transit	32	33¾
Philadelphia Traction	99¾	100
Public Service Corporation 5 per cent notes	97	97
Public Service Corporation certificates	70	70½
South Side Elevated (Chicago)	a93	92
Third Avenue	125	126
Twin City, Minneapolis (common)	110¼	112⅝
Union Traction (Philadelphia)	60½	61¼
West End (common)	96	96
West End (preferred)	116½	116

a Asked. W. I., when issued.

Iron and Steel

The "Iron Age" says that from all the principal distributing markets come the reports that in the raw material, pig iron, the buying movement is almost arrested. Many producing interests take the ground that a time like this is not the one to force sales and are withdrawing, and on the other hand, buyers are not being tempted by such concessions as are being made, like, for instance, the recent lowering of Southern iron to the $13 basis. The demand for steel billets continues fair, and there is still some scarcity. The volume of business in the heavier lines of finished iron and steel is heavy, and the amount of tonnage in sight is large. It is in the lighter lines of iron and steel that the situation is less satisfactory. It almost looks as though the jobbing trade had overbought early in the year.

STONE & WEBSTER GET GALVESTON SYSTEM

The Galveston Electric Company, recently incorporated, of which Stone & Webster, of Boston, are the managers, will take over the Galveston City Railway Company, of which Sanderson & Porter, of New York, are now in control. All reports to the contrary notwithstanding, Stone & Webster do not contemplate any changes in the local management at Galveston, nor do they contemplate at the present time the building of any interurban extensions. The Galveston Company operates 35 miles of line in the city, and furnishes power for lighting. The general manager and purchasing agent is H. S. Cooper.

NATIONAL ELECTRIC IN HANDS OF RECEIVER

John I. Beggs, a director of the North American Company, vice-president and general manager of the Milwaukee Electric Railway & Light Company, and president of the St. Louis United Railways, has been appointed receiver of the National Electric Company, of Milwaukee, of which he was recently elected president, in voluntary bankruptcy proceedings. The receivership is due to the defalcation of Frank G. Bigelow, of the First National Bank, of Milwaukee, who was chairman of the board of directors of the National Company. Two-thirds of the stock of the latter company was recently assigned to the First National Bank, of Milwaukee, as security for loans, and the bank is in control of the company.

INDIANAPOLIS TO TERRE HAUTE—BIDS WANTED

In connection with the recent purchase by Tucker, Anthony & Company, of Boston, and their associates of the Indianapolis & Western Railway, it is proposed to build from Indianapolis to Terre Haute. Already the grade from Indianapolis to Danville is about completed, and the work will be pushed as rapidly as possible so as to have the entire line running early in the spring of 1906. The National Railway Construction Company, of 53 State Street, Boston, has the contract for building and equipping the line. Randal Morgan, vice-president of the United Gas Improvement Company, is largely interested with Tucker, Anthony & Company in financing, constructing and equipping the line. The road will be built on the highest standards, and similar in general construction and design to the Indianapolis & Northwestern Traction Company. The National Railway Construction Company is preparing specifications and asking for bids for the apparatus to be used. R. P. Woods, Traction Terminal Building, Indianapolis, Ind., is the engineer who has these various matters in charge.

MAYOR JOHNSON MAKES AN OFFER FOR CLEVELAND LINES

Following the series of public meetings referred to in the last issues of the STREET RAILWAY JOURNAL, at which Mayor Johnson endeavored to induce the Cleveland Electric Railway to name a price at which it would give an option on its lines in connection with his proposed leasing scheme, the city executive sent a communication to the company asking that it submit the leasing proposition to the stockholders, and stated that in the proposition he would name a price at which the city would agree to take the property. If given this option it could be closed at any time within twenty-five years, providing the State gave the city the right of municipal ownership. Mayor Johnson stated the figure he would propose would be the recent selling price of the stock. This is a decided change from his attitude a short time ago, when he estimated the value of the stock at $53 per share, but it is not exactly explicit, as the stock has had a range of from 83 to 78 within the past three weeks.

On Tuesday, at a meeting of the factions, the Mayor formally offered 85 as an option on the stock of the company.

EARNINGS OF THE "L" AND THE SUBWAY IN NEW YORK

Earnings of the Interborough Rapid Transit Company, elevated and subway divisions, have just been made public. They cover the quarter and the nine months ending March 31 for the elevated; the quarter ending March 31 and the period from Oct. 27, 1904, when the subway was opened, until March 31, and the elevated and subway divisions for the quarter. The reports are generally considered excellent, and presage great things for the future, yet the strike of the employees early this year precludes fair comparisons. The elevated division showed quite a falling off as compared with last year, but gross and net earnings came almost up to the level of 1903, and exceeded those of any previous year. The subway did not begin operations until Oct., 1904, so that there is no corresponding period with which the quarter's result can be compared, but by reducing to daily averages the business for the quarter is largely in excess of the volume attained in the period ended Dec. 31. The earnings of both lines, elevated and subway, are largely in excess of those of the elevated road a year ago, and the surplus after all charges for the quarter is $729,097, an increase over 1904 of $527,085. These are the only comparative figures of real significance. The several statements follow:

INTERBOROUGH RAPID TRANSIT SYSTEM

(MANHATTAN AND SUBWAY DIVISIONS)

Quarter ended March 31, 1905—

	1905	1904
Gross receipts	$4,582,722	$3,845,121
Operating expenses	2,059,317	1,609,823
Net earnings	$2,523,405	$2,235,298
Other income	159,475	93,850
Total income	$2,682,880	$2,329,148
Fixed charges	1,953,783	2,127,136
Surplus	$729,097	$202,012

(MANHATTAN DIVISION)

	1905	1904
Gross receipts	$3,105,605	$3,845,121
Operating expenses	1,369,549	$1,609,823
Net earnings	$1,736,056	$2,235,298
Other income	75,500	93,850
Total income	$1,811,556	$2,329,148
Charges	1,717,584	2,127,136
Surplus	$93,972	$202,012
Nine months ended March 31—		
Gross receipts	$10,811,409	$10,441,584
Operating expenses	4,626,730	4,313,840
Net earnings	$6,184,679	$6,127,744
Other income	250,513	259,736
Total income	$6,435,192	$6,387,480
Charges, etc	5,352,340	5,220,190
Surplus	$1,082,852	$1,167,290

(SUBWAY DIVISION)

Quarter ended March 31, 1905—	
Gross receipts	$1,477,116
Operating expenses	689,767
Net earnings	$787,349
Other income	83,975
Total income	$871,324
Fixed charges	236,198
Surplus	$635,126
From Oct. 27, 1904, to March 31, 1905—	
Gross receipts	$2,289,116
Operating expenses	1,148,931
Net earnings	$1,140,185
Other income	98,488
Total income	$1,238,673
Charges	411,353
Surplus	$827,320

SUBWAY ROUTES FIXED IN NEW YORK

The New York Rapid Transit Commission, at its meeting on May 12, adopted all the tunnel routes informally chosen a week ago with the exception of that for a four-track subway in Thirty-Fourth Street. The commission decided to run the new Lexington Avenue route through Thirty-Fifth and Thirty-Sixth Streets, as originally proposed, and leave Thirty-Fourth Street as a route for an independent crosstown line or moving platform. This modification was brought about by a letter signed by Max E. Schmidt, Stuyvesant Fish and Cornelius Vanderbilt, representing the Continuous Transit Securities Company. The letter said that, subject to possible damages to abutting property owners, the Interborough Rapid Transit Company would be glad to have a moving platform on the Forty-Second Street spur of the Third Avenue Elevated road.

The engineers for the New York City Railway Company said they did not longer desire a four-track route through Thirty-Fourth Street, but preferred the route as originally laid down, with two tracks in Thirty-Fifth and two in Thirty-Sixth Street, between Lexington and Fifth Avenues. The Thirty-Fourth Street crosstown line will be built in two sections, one section being from the East River to Ninth Avenue, and the other from Ninth Avenue to the North River.

The commission authorized the extension of the Interborough system from the present northern terminus on the west side to Van Cortlandt Park, Mr. Bryan saying the cars would be running there within a year. Acting Engineer Rice said that trains would be running down Broadway from Fulton Street to the Battery within six weeks. Mr. Rice also said that as soon as leaks were stopped in the tunnel under the Harlem, that section would be put in operation. The Interborough Company's proposition to four-track the Second Avenue Elevated track was rejected.

On the four-tracking of the Fulton Street, Brooklyn, subway, a letter was read from August Belmont saying that the Interborough was willing to pay half the cost if the city would pay the cost of the connection. This offer was accepted. The city will pay $1,500,000 and the company $500,000.

TWIN CITY RAPID TRANSIT STOCK INCREASE—ITS PURPOSE

On May 5 the directors of the Twin City Rapid Transit Company decided to submit to the stockholders of the company a plan for increasing the capital stock $5,000,000. To carry out the plan a meeting of stockholders will be held in Elizabeth, N. J., on May 31. Last week there was issued by the directors a circular descriptive of the plan. It is proposed that the additional $5,000,000 be common stock. In connection with the increase the directors recommend an amendment to the certificate of incorporation providing that with the new stock there should be 30,000 shares of preferred stock and 220,000 shares of common stock, each of a par value of $100. The preferred stock shall entitle the holders thereof to receive out of the surplus, or net profits of the company, an annual dividend of 7 per cent, payable quarterly, before any funds shall be set aside for dividends on common stock. The fifth section of the certificate of incorporation will be so amended as to read as follows: "The period at which said company shall commence is the fourth day of June, in the year 1891, and shall continue perpetually."

It is explained in the circular to the stockholders that the current period of the company's existence will expire on June 1, 1941.

It is proposed to add a paragraph to the certificate of incorporation providing for a division of the board of directors into three classes. The term of office to be three years, and one class to be re-elected annually.

It is explained further in the circular that in order to amend the certificate of incorporation, as already outlined, it is necessary that two-thirds of each class of stockholders should assent to the proposed amendment, and for the purpose of voting on them a special meeting of the stockholders will be held at the company's office on May 31, as previously noted.

If the increase of the capital stock as proposed shall be authorized, $1,000,000 will be offered to the present stockholders of the company pro rata at par during the current fiscal year, the proceeds to be used in paying for extensions of the system recently authorized by the cities of St. Paul and Minneapolis. The balance of the new stock will be offered to stockholders for subscription hereafter at a price to be fixed by the board of directors.

President Lowry says that the $1,000,000 of new stock which it is proposed to offer to the stockholders soon will provide for the present needs of the company. He says that the proposed extensions will give the company about 50 miles of new track in sections about Minneapolis and St. Paul highly productive of traffic.

INSPECTION OF VANDERBILT TROLLEY PROPERTIES—W. J. VANDERBILT, JR., TO ENTER MANAGEMENT

Although it is almost a year since the Vanderbilts acquired control of electric traction lines in Central New York, it was not until last week that any member of the family inspected the properties. On May 11, William K. Vanderbilt, Jr., accompanied by officers of the Syracuse Rapid Transit Railway Company and the Utica & Mohawk Valley Railroad Company, made a trip over both these lines and the portion of the West Shore Railroad between Syracuse and Utica which is soon to be electrified. In conversation with the representative of the STREET RAILWAY JOURNAL at Syracuse, Mr. Vanderbilt intimated that the electrification plans are well advanced. C. Loomis Allen, general manager of the Utica & Mohawk Valley Railroad, gave more definite information. He said that it is probable that as soon as the electrification of the short portion of the West Shore near Ilion is completed the Syracuse-Utica link will be begun. E. G. Connette, general manager of the Syracuse Rapid Transit Railway, was host while the visitors were in Syracuse.

It is understood that the plans for bringing electric power from Niagara Falls to Central New York by the West Shore Railroad right of way are progressing satisfactorily. The Ontario Power Company, which is said to have an agreement with the Vanderbilt-Andrews syndicate, has just awarded to the Archbold-Brady Company, of Syracuse, the first contract for steel towers for the double transmission line from its plant on the Canadian side of the falls to the point on the American side at which the main transmission line is to begin. The Pittsburg Reduction Company has been given a large order for aluminum wire by the Canadian company.

Of interest in connection with the inspection of the New York Central's electric railway properties by Mr. Vanderbilt is the announcement made in New York, on Wednesday, May 17, to the effect that Mr. Vanderbilt will enter into the active management of these properties. Mr. Vanderbilt, so the announcement says, will be elected a director and vice-president of the Utica & Mohawk Valley Railway and of the Syracuse Rapid Transit Company.

ELECTRIC RAILWAY PROJECT FOR CUBA

Interests identified with the Havana Electric Railway Company have in contemplation the construction of 120 miles of electric railway in Cuba, having Havana as a center. To carry out the project there has been organized, under the laws of New Jersey, with a capital stock of $5,000,000, the Havana Central Railroad. It is proposed to take over the rights already secured by the Insular Railway Company, covering the only practical railroad entrance into the harbor and the business section of the city, and to carry out in their entirety the plans of this company. To do this there will be created a mortgage of $10,000,000. of which $5,000,000 will be issued at once, the remaining $5,000,000 to be retained in the treasury. These bonds will be drawn for fifty years, of the denomination of $1,000 each, and will bear interest at 5 per cent. A sinking fund will be begun in 1908 sufficient to retire the issue at maturity. In addition to the entrance to the city that the company will secure by the grant to the Insular Company, it will have access to Havana over the Havana Electric Railway, with which it has already entered into an operating agreement. The rights of the company are perpetual.

The railroad it is proposed to construct and operate is a line of general service, carrying all kinds of freight, and will also provide a frequent passenger service. Standard coaches, each seating fifty passengers, will be operated at intervals of one hour, and the freight service will be accomplished by using standard box, gondola and flat cars of the usual modern type, hauled by electric locomotives. In addition to this the road will have a number of freight cars equipped to operate independently, so as to provide a fast freight and express service. It is also proposed to construct all rolling stock by constructing a modern and up-to-date car works, and to use the company's power plant for furnishing light and power. The approximate cost of construction of tracks, lines, stations, rolling stock, etc., is $30,000 per mile. The office of the company in New York is at 52 Broadway.

MICHIGAN ROAD IN OHIO ASSOCIATION

In the report of the Ohio Interurban Railway Association meeting last week it was stated that the Grand Rapids, Grand Haven & Muskegon Railway had become a party to the interchangeable transporting agreement. This is incorrect. It should have been stated that the Grand Rapids, Holland & Chicago Railway has adopted the Ohio interchangeable transportation.

SAN FRANCISCO PLEDGED TO MUNICIPAL OWNERSHIP OF A SHORT LINE

The Board of Supervisors of San Francisco has finally passed the declaratory ordinance which pledges the city to reconstruct the Geary Street Railway as an electric line, to be operated by the municipality. There was no division of sentiment on the subject, and the vote for the ordinance was unanimous. The board further adopted a resolution appropriating $300 for the cost of making an estimate and plans for the road by a competent engineer.

CONDITIONS IN CHICAGO

The city of Chicago, on May 12, through Mayor Dunne, received a definite offer for purchase or lease of the street car tracks and franchises in the streets which Judge Grosscup recently decided had passed from the control of the Union Traction Company. John J. Cummings, of the McGuire-Cummings Manufacturing Company, of Chicago, made a definite bid for a contract with the city, either to buy the rails and wires or to lay new ones, and operate street cars till there shall be a court decision as to the legality of the certificates issued under the so-called "Mueller" municipal ownership law. Mr. Cummings' idea is merely to build and operate the road till the city wishes to purchase it from him with "Mueller" law certificates.

PHILADELPHIA SUBWAY AND "L" EQUIPMENT CONTRACT

The first contract for equipment for the subway and elevated lines being built in Philadelphia by the Philadelphia Rapid Transit Company has just been awarded. It is a contract for motors, and was given to the General Electric Company, of New York. In all thirty double-motor GE 66 (125 hp) equipments are involved. They are to be of the General Electric relay automatic control type. An option is pending on seventy more equipments of the same style.

The total length of the subway and elevated system will be about 8 miles, two of which will be subway and the other six elevated. The rolling stock will all be of steel, the type of car to be used being fashioned after the standard car in use on the Boston system. All cars of trains are to be motor cars. Each car will be equipped with two motors, and will weigh gross about 40 tons. At the east end of the line there will be a grade of 5 per cent for 800 ft. going from the subway to the elevated on Delaware Avenue. On the west end of the subway, at about Twenty-Second Street, there will be a 5 per cent grade, of approximately 1200 ft. to the elevated structure. From the Schuylkill River to the end of the line is approximately 6 miles. The number of stops one way, including terminals, will be 16, and it is expected to make a schedule, including these stops, of 15 m.p.h.

ELECTRICITY ON THE SOUTHERN PACIFIC

The San Francisco News Bureau says that the object of the recent trip of A. H. Babcock, electrical engineer of the Southern Pacific Railroad, to the East was to present plans for the changing of the motive power of the Southern Pacific Company's line from Sacramento to Reno to electricity. Under this plan, the company proposes to generate its own power in the mountains and do away with the present expensive and unwieldly method of transporting heavy freight trains over the mountains. If this plan is finally adopted, it will make the construction of the big Sierra tunnel a less urgent matter, and at the same time provide a greatly improved method for handling the mountain traffic during the construction of the tunnel. The matter of making a similar change in the motive power between Bakersfield and Los Angeles is also under consideration, says the News Bureau, but this change is not likely to be made until after the Sacramento-Reno section has been electrified. It is practically settled that the local ferry lines will never be changed into an electric system. The company feels that the benefits to be derived would be greatly outweighed by the monetary expenditure involved, especially in view of the fact that it may not be long before a motor car suitable for this traffic is perfected.

STEEL CARS FOR CENTRAL RAILROAD

It is reported in New York that the New York Central Railroad Company has placed an order with the American Car & Foundry Company for 150 all-steel passenger cars for use on its suburban lines out of New York, which are now being electrified.

THE STORAGE BATTERY EQUIPMENT FOR THE ELECTRIFIED DIVISIONS OF THE NEW YORK CENTRAL AND LONG ISLAND RAILROADS

Details have just come to hand of the contract which the Electric Storage Battery Company, of Philadelphia, secured recently, covering the installation of chloride accumulators in the eight sub-stations of the electrified portion of the New York Central Railroad for some 55 miles. The batteries and boosters will be distributed and made up as follows:

Location	Batteries Number of Cells	Batteries Discharge Rate for One Hour	Number of Boosters
G. C. Station	318	4020	2
Mott Haven	318	3750	2
King's Bridge	318	3000	2
Yonkers	318	2250	1
Irvington	318	2250	1
Ossining	318	2250	1
Bronx Park	318	2250	1
Scarsdale	318	2250	1

The elements in these battery installations will be made up of plates of the Electric Storage Battery Company's type R, which has been especially developed for heavy railroad work and high discharge rates. The plants are designed to take full advantage of such rates, and in cases of emergency it is expected that momentary discharges up to three times the one-hour rate may be called for. The eleven boosters (two operating in parallel at each of the three larger plants and one at each of the others) will be identical, and of capacity corresponding to the maximum discharge rates of the batteries. Each booster will consist of a direct-current generator direct-connected to a three-phase induction motor, wound for the same alternating-current voltage as the rotaries, but connected to a special set of static transformers. The booster field will be separately excited by a direct-current motor-driven exciter. Two such exciter sets are to be installed in each sub-station, each having sufficient capacity to control the fields of two boosters operating in parallel. The fields of the exciter will be controlled by a company's recently perfected carbon regulator, which thus controls the booster voltage, causing the battery to charge or discharge in response to changes in load on the sub-stations.

Power will be generated at two distinct generating stations, one located at Yonkers and one at Port Morris, and transmitted at 11,000 volts, three-phase, over high-tension lines, so arranged that any sub-station may be supplied from either power station.

The various advantages derived from the operation of these batteries are, therefore, secured with practically no increase in investment or operating expenses. Among these advantages, the features of reserve capacity and insurance against interruption of service was one of the most important considerations that led the management of the New York Central & Hudson River Railroad and the commission of consulting engineers to instal these batteries. It is estimated that the total battery capacity is sufficient to carry the entire load on the system for a period of about an hour during average conditions of traffic or for half an hour at the time of maximum schedule. Provision has been made for future increase of capacity by providing tanks somewhat larger than required for the number of plates first installed.

The company has also installed at the Hammel sub-station of the electrified division of the Long Island Railroad, a battery of 300 cells, type R-55, chloride accumulators, having a capacity of 3200 amps. for one hour. In connection with this battery there are two boosters, operated in parallel, and each having a capacity corresponding to half the maximum output of the battery. These boosters are controlled by a newly-devised carbon regulator, which automatically causes the battery to charge and discharge in response to load fluctuations, and permits the convenient adjustment for any desired division of load between the battery and the rotaries.

OHIO AND MICHIGAN TROLLEY TRIP

Last week the Lake Shore Electric Railway, of Cleveland, and the Detroit, Monroe & Toledo Short Line, of Detroit, tendered a complimentary excursion from Cleveland to Detroit, to newspaper men of the towns between these cities. It was intended to demonstrate the possibilities for through traffic between Ohio and Michigan, and was a return trip to one made a short time ago from Detroit to Cleveland. A special car left Cleveland at 7:30 a. m., as first section of the morning limited, and it ran on limited time, picking up guests at various points along the line. Dinner was served at the Boody House, and the party arrived at Detroit at 4:30 p. m. At 6 p. m. supper was served at the Russell House, and the return trip was started at 8:45 p. m., the run being made in six hours. Addresses were made by several prominent newspaper men. President Mathew Slush, of the Short Line, announced that his company had ordered special equipment, which would be used for through limited service between Cleveland and Detroit, eliminating the change at Toledo.

Editors of thirty-six Ohio papers made the trip beside the following railroad men: Mathew Slush, president; W. B. Tarkington, general manager; Judge Riley, director, Detroit, Monroe & Toledo Short Line; F. J. Stout, general superintendent; F. W. Çoen, secretary; H. K. Surbeck, passenger agent, Lake Shore Electric Railway; George Radliff, superintendent, Cleveland Electric Railway; C. F. Franklin, general manager; C. E. French, auditor, Toledo & Western Railway; D. H. Lavenburg, general manager, Toledo & Indiana Railway; H. C. Warren, general manager; L. E. Flory, vice-president, Toledo, Port Clinton & Lakeside Railway; J. F. Collins, superintendent; E. H. Eckert, claim agent, Toledo Railway & Light Company; Charles Currie, general manager, Northern Ohio Traction Company; J. Jordan, general superintendent, Cleveland & Painesville & Eastern Railway; C. A. Kenworthy, general manager, Electric Package Company, and George S. Davis, of the Street Railway Journal.

The Lake Shore and the Short Line are two of the best examples of high-speed interurban lines in the country, and many favorable comments were made relative to the speed, construction and equipment of the roads.

PUBLICITY AS AN AID TO MANUFACTURES

At the annual dinner of the Manufacturers' Advertising Club of Cleveland, held on May 9 at the Hollenden Hotel, Arthur Warren, publicity manager of the Allis-Chalmers Company, delivered an address on "Publicity as an Aid to Manufactures." Mr. Warren laid great stress upon the importance of publishers of technical papers making public the extent of their circulation. "Many publishers," he said, "are afraid to disclose these figures, fearing that if the advertisers knew the facts they would withdraw their advertising. Happily, those publishers who scorn publicity do not represent the most progressive element in the trade journal world. Happily, there are exceptions to the rule of mystery and dread. We know them, the men who have the courage to stand upon the merits of their journals. They are the men with whom we should do business; theirs are the papers we should seek. The stronger they are, the better for our work. With such publishers a publicity department co-operates. We can help the live publishers and they can help us. They know it and we know it."

Mr. Warren's long experience shows that publicity brings business. Manufacturers who do not buy publicity as liberally as they buy other selling facilities will some day have to take their places at the rear of the procession. The manufacturer who does not provide a publicity department of his own, small or large, and push it and develop it as he does any other branch of his business, is neglecting a great and profitable opportunity.

The speaker also urged his hearers not to take a narrow view of the subject. Advertising, whether direct or indirect, must be done generously if it is to bring results. The chief thing is to let the world know who you are, where you are, and what you are doing; and you cannot do this on a large scale by stopping to take a census every time you fire a volley.

DAILY REPORT OF THE RAILWAY CONGRESS PROCEEDINGS

A conspicuous and valuable feature of the sessions of the International Railway Congress, at Washington, was the elaborate daily published by the "Railway Age," of Chicago. This paper was published for eleven days, commencing with May 3, when an informal issue appeared, and concluding with May 14. No issue appeared on May 8, as there were no sessions on Sunday, May 7. Two editions were published, one in English and the other in French, and a large corps of editors, reporters, translators and compositors was required in Washington. The paper not only contained a report of the proceedings but the programmes, notices, accounts of the exhibits, and other interesting information. Altogether the publication was one of which the publishers and all concerned can well feel proud.

FRANCHISE RIGHTS IN NEW YORK—COMPANIES CAN'T POSTPONE INDEFINITELY THE CONSTRUCTION OF LINES

The right of railway companies to postpone indefinitely the construction and operation of a road, and still maintain unimpaired original franchise privileges, is generally denied by Attorney-General Mayer, of New York, who writes an interesting opinion in granting the application of the city of Rochester to bring an action for the forfeiture of certain grants made some time ago to the street railways of that city. A railway company, he says, is bound to build and operate its road within a reasonable time after receiving the city's consent to the use of its streets.

The application of the city of Rochester affects several franchises granted to three different companies, some of them as far back as 1862, and all now owned by the Rochester Railway Company. The company maintained that the conditions imposed by the Common Council requiring operation under the franchise within a definite time were invalid. To this the Attorney-General replies:

"The right of a municipality to assent to the use of its streets by a railway company involves the right to impose any and all reasonable conditions."

Regarding the older franchises, granted without condition, the Attorney-General says:

"The railway company having accepted the consent of the city was bound to act under it; it could not accept franchises given to it, and then leave them in abeyance indefinitely, for those franchises were granted not exclusively for the benefit of the railway company, but also in the interest of the public. It cannot be that the city meant to confer these franchises upon the railway company, leaving it optional with the company whether it would build its road in one, or twenty or fifty years.

"There is a reciprocal obligation. On the one hand, the railway company was seeking rights which bade fair to become highly valuable, and on the other hand, the city was granting these rights in the expectation of increased transportation facility for its inhabitants. I think, therefore, that there has been an undoubted abandonment of the franchises granted, and that an action will lie to have such abandonment judicially declared."

OFFICERS OF THE A. I. E. E.

At the annual meeting of the American Institute of Electrical Engineers, held at New York, May 17, Dr. Schuyler Skaats Wheeler, of the Crocker-Wheeler Electric Company, was elected president for the ensuing year. Dr. Wheeler received 1031 votes, the largest ever cast in an Institute election. The other officers elected were: Vice-presidents, Charles A. Terry, Townsend Wolcott, Gano S. Dunn; managers, Cummings S. Chesney, Calvert Townley, Bancroft Gherardi, Charles L. Edgar; treasurer, Geo. A. Hamilton; secretary, Ralph W. Pope.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED MAY 9, 1905

789,201. Street Car Fender; George H. Bolduc, Detroit, Mich. App. filed Aug. 22, 1904. Means whereby the fender will be automatically dropped upon the track in case an obstruction is encountered.

789,216. Switch Operating and Locking Device; James Hart, Johnstown, Pa. App. filed Dec. 26, 1903. Consists of a movable switch-tongue, a spring-box, springs secured to opposite sides of the box, and links or toggles connected to the tongue and to the springs.

789,225. Underground Conduit for Electric Railways; John H. Munson, Chicago, Ill. App. filed July 10, 1896. Arranged along the side walls of the conduit are laterally movable plungers, which are pressed into contact with the electrical conductor by the plow of the car. Relates also to special water-tight features.

789,248. Car Seat; Hiram E. Ackerly, Brooklyn, N. Y. App. filed Jan. 20, 1905. Details of a walk-over seat.

789,270. Steel Casting; George M. Ervin, Johnstown, Pa. App. filed Jan. 2, 1904. A crossing-plate consisting of a central portion and diverging rail members, the webs of the latter, at said central portion, being united by a connecting web of substantially uniform thickness therewith.

789,289. Steel Casting; Frank Nather, Johnstown, Pa. App. filed Jan. 2, 1904. A cross-plate consisting of a central connecting portion and diverging rail-member portions, the rail-member portions being connected in pairs by webs extending continuously through the central portion.

789,292. Roller Side Bearing for Cars; John F. O'Connor, Chicago, Ill. App. filed Jan. 19, 1905. Details of construction.

789,383. Electric Trolley; Charles L. Rogers, Uxbridge, Mass. App. filed Nov. 30, 1903. Details of a readily detachable trolley wheel.

789,402. Electrical Collector; Peter Ackermann, Chicago, Ill. App. filed Sept. 4, 1902. The third-rail is supported by links extending through counter-sunk apertures in the bracket hanger.

789,511. Car Truck; William Voss, Wilmington, Del. App. filed Feb. 20, 1905. The springs are located to one side of the journal-boxes, thereby providing a minimum height of frame.

789,551. Brake Operating Means; Louis C. Kohler, Milwaukee, Wis. App. filed Sept. 6, 1904. Consists of a wheel, a brake therefor, a roller adapted to be brought into engagement with the wheel to receive rotary motion therefrom, and a movable part in connection with the brake and bearing on the roller, and on which the roller rides when turned by the wheel to wedge itself between the wheel-surface and the movable part, and force said part to move and thereby apply the brake.

789,582. Switch Operator; Reison C. Wright, Colorado Springs, Col. App. filed Feb. 4, 1905. Details.

789,613. Trolley Wire Splicer; William L. Kerlin, Wyoming, Ohio. App. filed Jan. 4, 1905. The ends of the broken wire are inserted in a sleeve, screw-threaded at each end, for the reception of threaded collars, portions of the sleeve being cut away at the ends, whereby the collars will directly engage the wire through the cut-away portions.

789,649. Electrofluid-Pressure Switching Mechanism; Walter J. Bell, Los Angeles, Cal. App. filed Jan. 18,1904. A track switch, having pendent conductors adjacent to the roof of the car, which are electrically charged by the trolley wire. Push buttons upon the car are operated to close a circuit to a rail magnet, which in turn closes a local circuit magnet, which operates pneumatic valves for the switch.

789,666. Trolley; James W. Patterson, Cutley, Ohio. App. filed Jan. 5, 1905. Details of construction.

PERSONAL MENTION

MR. D. PERCY HARTZELL, of Frostburg, Md., has been appointed secretary and treasurer of the Cumberland & Westernport Electric Railway, of Cumberland, Md., to succeed Mr. W. H. Roberts, resigned.

MR. M. C. LUDLAM has resigned as superintendent of the Little Rock Railway & Electric Company, of Little Rock, Ark., and will be succeeded temporarily by Mr. C. J. Griffith, who has been with the company about nine years.

MR. LLOYD LYON has resigned the position of auditor of the Montgomery Traction Company, of Montgomery, Ala., to accept the position of auditor and assistant treasurer of the San Juan Light & Transit Company, of San Juan, Porto Rico.

MR. JOHN DAVEY, for the past eight years with the Winnebago Traction Company, of Winnebago, Wis., has accepted the position of superintendent of the power house, gas department and rolling stock of the Eastern Wisconsin Electric Railway & Light Company.

MR. M. J. LOFTUS has been appointed general superintendent of the Dayton, Springfield & Urbana Railway and its subsidary roads, the Urbana, Bellefontaine & Northern and the Springfield & Western. He was formerly with the Central Market Street Railway, of Columbus, and before that was with the Indianapolis & Martinsville Traction Company and the City & Suburban Railway, of Baltimore. Mr. M. M. Reed, who has been acting superintendent of these roads, will return to his duties as master mechanic of the Appleyard system.

MR. FRANK C. RANDALL, who recently resigned as vice-president and general manager of the National Electric Company, of Milwaukee, has just accepted the position of manager of the New York office of the Allis-Chalmers Company. Mr. Randall has long been prominent in electrical and street railway circles, both as representative of the J. G. Brill Company and of the National Electric Company, with which he has been associated for the past ten years. Under his management the sales of the National Company rapidly increased, and his knowledge of street railway conditions and ability as a salesman will be of great value to him in his new capacity.

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REMITTANCES.—Remittances should be made by check, New York draft, or money order, in favor of the Street Railway Journal.

Change of Address.—The old address should be given, as well as the new, and notice should be received a week in advance of the desired change.

Back Copies.—After July 1, 1905, no copies will be kept on sale beyond fifteen months prior to date of issue, except in bound volumes.

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 8000 *copies are printed. Total circulation for* 1905, *to date,* 172,850 *copies—an average of* 8231 *copies per week.*

Interurban Competition from Steam Roads

Notice appears elsewhere in this issue of the inauguration of a so-called interurban service by the Illinois Central in Illinois over two portions of its line. The Chicago & Alton Railway began this movement with the inauguration of a similar service in two places early in April.

Although we have commented on the situation before, we cannot refrain from quieting the fears of some who seem to think that this kind of war on electric interurban business is likely to prove a serious obstacle in the way of interurban electric railway construction. Those who have been watching the game for the past seven years know that these attempts to make a steam service compete with electric service or prevent the establishment of an electric service are by no means new, although they break out afresh in different parts of the country from time to time. A few years ago it was the steam roads in the vicinity of Indianapolis that were attempting the undertaking; now it is the Illinois steam roads. The plain and heretofore unpublished truth of the matter is that a review of past failures of attempts to make steam locomotives do the work of electric motors in this work forces the conclusion that this steam interurban service in Illinois is only intended by steam railroad companies either to temporarily scare capital out of the building of parallel electric roads or to hold and develop the territory until the steam road itself shall equip in some way for electric interurban service.

In the case of the recently started Illinois Central service between Kankakee and the terminus of its present suburban service south of Chicago, it would seem likely that the management of the railroad had wisely decided to hold this territory by means of frequent steam service until such time in the near future as electric traction may be installed for its entire suburban service, at which time it would be extended as far as Kankakee. If these steam railroads are merely starting this steam service in the hope that gasoline motor cars can be developed to handle the same business, we fear that they are on the wrong track. We believe there is a field for the gasoline motor car, but it is not in locations where money is likely to be invested in regular interurban roads. It is rather in more sparsely settled districts. There is but little reason to expect that developments will prove otherwise. The cost of gasoline for operation of a large gasoline motor car is in itself an imposing item of operating expenses, and we cannot help thinking that its use is a mistake in heavy service and that its proper place is on light cars approaching automobile 'buses in weight.

It has been suggested that the electrical operation by steam railroads of suburban trains on the present rights of way would seriously cripple the finances of parallel interurban electric roads. That there would be some effect in many cases is undoubtedly true. The complications which would result if the same tracks employed for steam trains are used are considerable, however, and the cost of laying an extra track or set of tracks on the right of way would usually be almost as much as if it was built elsewhere. Moreover, the location of the interurban electric road is usually such as to be favorable for local traffic, while the steam road location is more suitable for through traffic. We think, therefore, that once a parallel interurban electric road has been built, the competing steam road is not any more likely to put on an interurban electric service than is some other interurban company likely to build a parallel line. Danger of foolish competition by the paralleling of one road by another exists in all railroad work. The financial disasters that usually accompany such attempts, except where traffic is very dense, have taught investors and promoters a sufficient lesson, so that it is only occasionally that a company has to learn the lesson over again.

The High-Speed Question at the Congress

We cannot refrain from some further comment on the important paper by Dr. Schulz on the Zossen experiments, and the subsequent discussion. As chairman of the body under whose direction the experiments were carried out, he was able to speak with the authority of personal knowledge. We have so often discussed the Zossen results in their various phases that much of Dr. Schulz's admirable paper would be old to our readers, but he brought out some points which are unfamiliar and worth more than a passing comment. In the first place, with respect to brakes and braking, the outlook seems to be better than the first reports indicated. Even at the extreme speed of 125 m.p.h. or so, the brakes stopped the car in less than a mile, while this distance could be greatly reduced without passing the limit of safe retardation. The difficulty in seeing the signals easily at high speeds, of which much has been made by those who hold an ultraconservative point of view, seems from Dr. Schulz's statements to have been a real difficulty, but yet one that was in fact successfully overcome by electrically-operated signals within the car itself. There is no doubt that a system of signaling with marks quite big enough and distinct enough for low-speed railroading might yet be quite inadequate for speeds of 100 m.p.h. or so, and yet, putting aside for the moment the device used at Zossen for signaling within the cars, increased visibility is the only thing needed at the higher speeds, and this can certainly be attained whenever there is real need of it.

Very interesting were Dr. Schulz's comments on the general question of safety. Surely pioneering work like that at Zossen would hardly seem tame or restful to the nerves, and yet there seems to be a general consensus of opinion that the trips were not in the least scary, that there was no special sense of danger, and that traveling at such speeds was upon the whole very comfortable. This is certainly in line with general experience at more moderate speeds, assuming a good track, which, after all, is the key to high speeds. As between 50 m.p.h. and 70 m.p.h. or 75 m.p.h. there is little difference that is apparent to the passenger, and unless the cars were forced into swaying, much greater speed should be feasible without discomfort. The earlier conceptions of slender cigar-shaped steel cars hurtling through space seem to have vanished, leaving in sight the familiar parlor car, with all the comforts thereunto appertaining. A bit of the discussion bore upon the guard rails used during this high-speed work. That such a guard rail is of service in preventing derailments we doubt, but Dr. Schulz's opinion that it was valuable in stiffening the track suggests to us that an equal expense put into heavier track construction of the ordinary sort would probably have yielded better results. Given well-balanced trucks with long wheel base and a really solid track, high speeds should be comfortable enough to suit anybody. In response to some criticisms of Mr. Laurent on the enormous expense of high speeds, Dr. Schulz agreed that special high-speed roads would be expensive, but intimated that, since two great electrical construction companies were maneuvering to get hold of the Berlin-Hamburg concession, the project might well be regarded as commercially practical.

This suggestion of activity on the Berlin-Hamburg line is really the most hopeful thing looking toward high-speed railroading that has come to our notice. Our readers are probably all more or less familiar with this projected line through our various comments upon it. The distance, 177.6 miles, is quite long enough to give a clear run to good advantage, although hardly long enough to exploit the speed for its full commercial value. The running time proposed was stated by Dr. Schulz to be an hour and a half, instead of the three and a half hours of the present express trains. The objections as to cost raised by Mr. Laurent were hardly fair as regards motive power, since he compared the power taken by the Zossen motor cars with the power required for trains on the Paris-Orleans line. Had the Zossen work been credited, as it should have been, with the less work demanded by trailers, it would have made a much more favorable showing. The trailers were not used for the extreme speeds because their trucks were not properly balanced, and not from lack of power. Everybody realizes that single motor cars at high speed are altogether inadvisable. That special tracks are required for these high-speed projects is undeniable, but on the other hand, the tracks need be no more expensive than those actually in use on first-class trunk lines. Success is a question of earnings rather than of economics in cases of this kind. Dr. Schulz's bland inquiry as to whether a high-speed road from Washington to Baltimore, Philadelphia and New York would not be likely to pay, is one which somebody should be able to answer, although, as we have many times pointed out, the real difficulty in such a case is the practical impossibility of breaking through the opposition of existing roads to the franchises. In Germany the situation is entirely different, and it really looks as if high-speed electric traction had a fighting chance for its life there. Certainly the question is frankly up for discussion upon its merits, and that before a government that has full power to act.

Traffic Follows the Transportation

We wish to emphasize a point brought out by Clement F. Street in his recent paper before the Western Railway Club at Chicago, an abstract of which is published elsewhere, which point was further emphasized in the discussion of the paper by some experiences cited by H. M. Brinkerhoff, general manager of the Metropolitan Elevated in Chicago. The principle laid down by Mr. Street was that all suburban traffic is competitive in one way or another. Even if a territory is served by only one road that territory comes into competition with some other territory. The one having the best service builds up most rapidly. This is illustrated in the growth of every city large enough to have street railway facilities, and is especially noticeable in large cities which have both steam and electric railway suburban service. This does not mean that it is wisdom to build magnificent transportation facilities into a territory where nobody lives, because the company must wait too long before it will get sufficient gross receipts to pay operating expenses. However, where a road already has some traffic, it is the policy of the best and broadest suburban traffic managers always to keep the transportation facilities a little ahead of those which the traffic absolutely demands. Steam road suburban service has too frequently been considered a necessary evil and an unprofitable part of its business by steam railroad companies. There is no reason why it cannot be made profitable if proper equipment is used. The track facilities must be such, however, that the suburban portion does not seriously interfere with the through business of the railroad. A number of steam railroad companies are attempting to do too many things over a single pair of tracks. It is usually the case that there are a number of through trains leaving a large city about the time of the rush-hour traffic in the evening, and likewise a number arriving early in the morning. Suburban service does not mix well with through train service. Of course, some steam railroads are so situated that they cannot get sufficient track facilities, but frequently they have rights of way over which it would be easily possible to carry on more business than is now being conducted.

The Men Who Will Electrify Steam Roads

The same meeting of the Western Railway Club of Chicago, where the electrical equipment of steam railroads came up for discussion, brought forcibly to the minds of some of the street railway men present the fact that when such electrical equipment takes place it will be the electrical engineers who have gained their education and training on street railways, rather than steam railroad engineers, who will take the most active part in the change. This is perhaps what might be expected in view of the fact that street railway men have been studying practically the problem for so many years, while all the training and tradition of the steam railroad men are in another direction. At the meeting referred to of the Western Railway Club, which is an organization composed entirely of steam railroad men, the discussion was almost entirely by electric railway men, who through a general interest in the subject had attended the meeting. This lack of discussion of the subject by the steam railroad men was a disappointment to some of the electrical engineers, who had hoped that the ideas of some of the steam railroad men on this subject would be brought out at this meeting. The fact of its existence indicates that the rank and file of the men at present engaged in the operation of steam railroads have given the matter of electric traction very little thought. Some of the higher officers are considering the matter, as all who are acquainted with the inside affairs of some of our largest steam railroad companies are aware, but in all cases where any real change to electricity is contemplated, these officers are looking for advice from outside electrical engineers rather than from men whose training has been entirely along steam railroad lines. In spite of this fact we know there is among many steam railroad operating men a desire to learn everything possible about electrical matters. In fact, we learned the other day of a large railroad company which has quietly established evening classes in electricity among some of its locomotive engineers and shop men, with the expectation of having them prepare to take charge of electrical apparatus when it shall be installed on the road in the course of two or three years.

Hardening to Complaints

An electric railway manager at one of our State conventions recently remarked, in discussing some change which his company had made, that, of course, it resulted in some kicks, but that anyone who operated an interurban road long would get so used to that kind of thing that it would not bother him. This casual remark brings to mind very forcibly some of the trying features of the electric railway manager's position. It is inevitable, in the operation of any railway, that there should be complaints, and it is one of the necessary qualifications of a railway manager that he be able to receive complaints in the proper mental attitude. It does not do for him to become so thick-skinned that none of the kicks which reach him have any effect. On the other hand, he must not allow trivial matters and unfair criticisms to weigh on his mind too heavily. If he acquires too much a habit of indifference to complaints he is likely some day to be shelved along with the former generation of steam railroad managers who believed in the "public be damned" policy. If, however, he takes the opposite attitude, he is likely to be a candidate for the insane asylum before he has held his job many years. It is undoubtedly true that the average man in a position where he has to listen to many complaints drifts naturally into a habit of indifference toward them, and it is necessary to guard against it, as it will lead to the ignoring of just complaints. When charges are made about public service of any kind, whether street railway, telephone, electric lighting or water service, there is on the part of the complainer an irresistible tendency to exaggerate which can be likened only to the customs of certain Oriental nations. Seconds become minutes in the mind of the kicker, and other trouble grows in proportion. This fact in itself makes it necessary for the manager, or whoever receives the complaints of the public, to use a great deal of discrimination and good judgment. He must listen to all charges with a perfectly balanced mind, remembering that there may or may not be grounds for them, and that everything should be given its due and fair consideration. It is not safe to drift into a habit either of indifference or of undue worry.

Routeing Cars by Color

The painting of cars is a subject of importance on every street railway, and the practice adopted in different localities varies widely in its influence upon operating conditions. Among the many questions which now and then spring up in regard to painting, the problem of routeing cars by color easily takes a prominent place.

In the earlier days of street railway work it was almost universally the custom, in cities of both large and small population, to paint the cars in different colors corresponding to the routes to be traversed. This plan prevented the interchange of equipment and decreased the flexibility of the service, although it had the advantage of enabling would-be passengers to distinguish cars at a greater distance than was possible by the simple use of signs. Hence, there has grown up a feeling in some quarters that one standard color for the rolling stock is the best practice, and of late the adoption of a single color has been a prominent feature of street railway practice in many of the small and medium-sized cities, where the routes are few in number and not greatly complicated.

Very large cities, characterized by scores of routes of more or less intricacy, are in much greater need of separate colors upon their rolling stock. In the daytime it is certainly a noteworthy advantage to both passengers and employees to be able to distinguish cars several hundred feet away. Then, too, on a large system the percentage of cars out of service for repairs, cleaning, etc., is likely to be of smaller consequence than on a small road. Thus, a road operating a thousand cars may have at any one time a hundred cars in the hospital, but with these units of rolling stock distributed over perhaps an equal number of routes, the service is not seriously crippled on any one route because of the scheme of colors adopted.

Finally, the simplicity and lessened cost of uniform coloring commends itself to the medium-sized and smaller roads, while for interurban service there seems to be practically no need of any diversity in coloring on the lines of the same company. When a road develops to the point, however, where the withdrawal of from 5 per cent to 15 per cent of its cars from service causes no very serious gaps in the service of any particular line, to speak in the rough, it may then in some special cases be an advantage to adopt route colors on the rolling stock. Wherever uniform coloring is adopted, only adjustable or removable signs should be employed upon the cars.

THE SYSTEM OF THE BLOOMINGTON & NORMAL RAILWAY, ELECTRIC & HEATING COMPANY

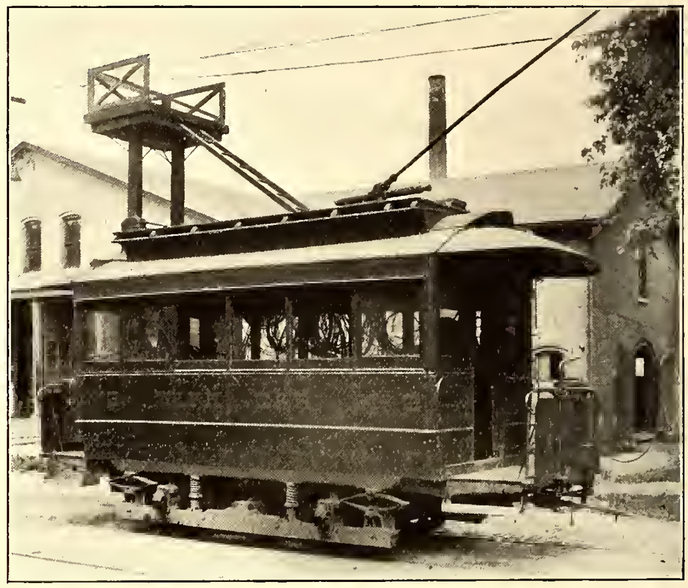
BY C. H. ROBINSON

A characteristic example of expansion along other lines by a public service corporation originally organized for railway operation only is afforded by the Bloomington & Normal Railway, Electric & Heating Company, which, as its name indicates, not only furnishes the transportation facilities of Bloomington and Normal, Ill., but also carries on a general lighting and heating business. Bloomington is a flourishing industrial city with a population of some 31,700, and is 3 miles from the town of Normal, which numbers 4700 and is the seat of the State Normal School.

FULL CONVERTIBLE CAR BODY MOUNTED ON AN 8-FT. WHEEL-BASE TRUCK

THE RAILWAY SYSTEM

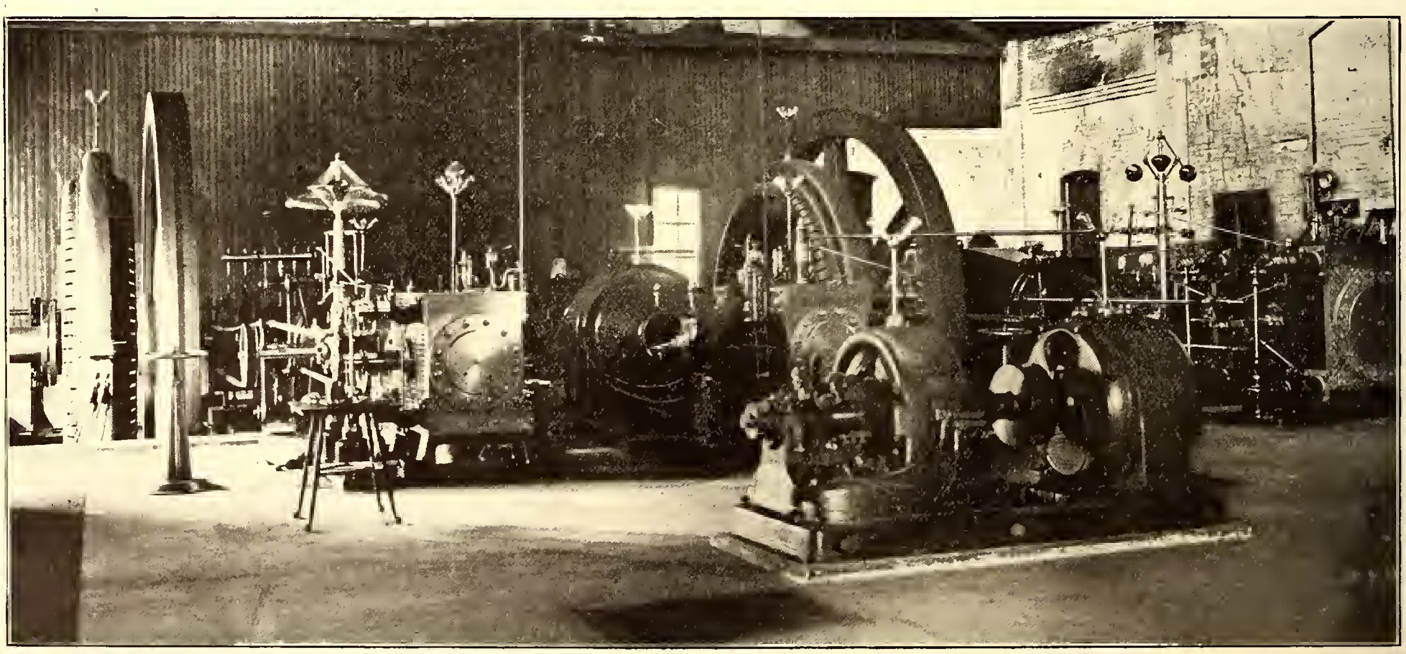
As early as 1867 a steam dummy passenger and freight line was installed for service between Bloomington and Normal, the principal traffic being the haulage of freight cars from the Chicago & Alton Railroad at Normal to a flour mill at Bloomington. This freight business was soon discontinued, but the passenger service has been carried on continuously through all the changes in motive power. The steam dummy engines were operated a few years, but then were displaced by animal traction, which was in use up to 1890. In that year the Daft system was installed, but was abandoned two years later in favor of Westinghouse and Short apparatus. The substituted equipment gave good service up to 1902, in which year the belted units in the power house were replaced by the direct-connected type, new car material purchased and additional lines constructed.



HOME-MADE TOWER CAR ON THE BLOOMINGTON & NORMAL RAILWAY

The present system comprises approximately 16 miles of standard gage single track, located in and between the towns of Bloomington and Normal. T-rail is used on all lines, but varies in weight and length as follows: Length, 30 ft. and 60 ft.; weight, 45 lbs., 60 lbs. and 70 lbs. per yard. The rails are laid on white oak or cedar ties, are bonded with 10-in. 0000 Crown bonds and cross-bonded every 300 ft. with 0000 Crown solid copper bonds. The track is ballasted with cinders.

The poles used for the overhead work are of 7-in. white



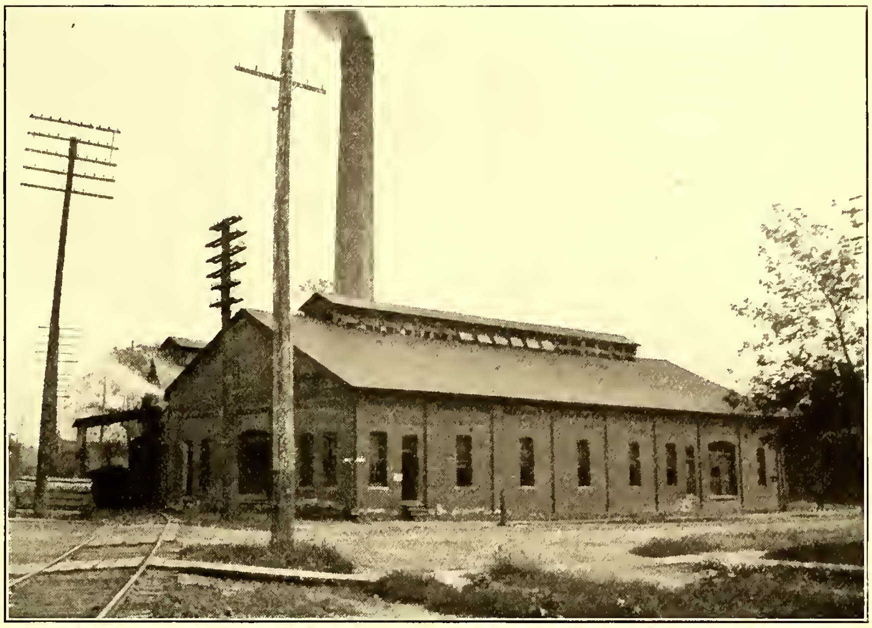
GENERAL VIEW OF THE ENGINE ROOM OF THE BLOOMINGTON & NORMAL RAILWAY, ELECTRIC & HEATING COMPANY cedar or chestnut, 30 ft. high, or where of iron, consist of three sections making the same total height. All line material is of the Ohio Brass Company's manufacture. The trolley wire is either of the No. 0 round type or No. 00 grooved type.

This railway regularly operates fourteen cars during the summer months, but has eleven extra motor cars to handle additional traffic. The complete rolling stock equipment now includes two 30-ton double-truck closed cars equipped with GE 57 motors, two 15-bench open cars furnished with Westinghouse No. 56 motors, four convertibles using Westinghouse No. 49 motors, seventeen miscellaneous cars, one line work car, one 3000-gal. pneumatic street sprinkler and a rotary snow sweeper.

An interesting feature in connection with the company's line work is the home-made tower car illustrated, which was constructed at a cost of less than $100 for labor and new material. The car body, trucks and motors were worked over out of discarded equipment. The body once belonged to an old horse car. The 20-hp motors used are of the Short type and are regulated by the old Westinghouse type-D controllers. The tower is raised and lowered by means of a windlass conveniently arranged on the inside of the car. When the tower is lowered and the top railing folded down, it sets close enough to the car roof not to interfere with the trolley under 12-ft. headroom. The work bench, which extends the entire length of one side of the car, has under it an ample number of drawers and pigeon-holes for tools and emergency material for quick repairs to either the overhead line or damaged cars.

THE LIGHTING SYSTEM

The lighting system is of the alternating-current type throughout. Although the transmission voltage is 2200, only a small portion of the wiring is run in conduits, the greater part being strung on wooden poles, which also carry the step-down lighting transformers. In Bloomington, current is supplied to some 300 multiple arcs and 10,000 incandescent lamps, while in Normal a Western Electric 70-light series-alternating system is used to furnish arc lights for both the streets and State Normal School.

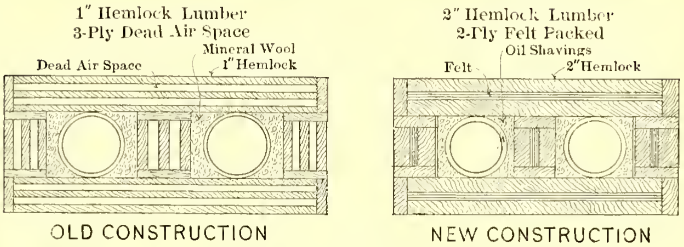


THE NEW POWER HOUSE AT BLOOMINGTON

A CORNER OF THE ENGINE ROOM

THE HEATING SYSTEM

In connection with its power station, the company supplies to business houses, flats and private residences at 18 cents to 20 cents per cubic foot a total of 83,000 sq. ft. of radiating surface by employing the Yaryan system of transmitting water which has been heated by exhaust steam. The same water is used over and over again, the leakage being supplied by a small automatic pump. The equipment includes eight heaters (one of 5000 sq. ft. of radiating surface) and two duplex pumps for forcing the hot water through the pipes at 60 lbs. pressure, returning at 30 lbs.



SECTIONS OF OLD AND NEW HEATING CONDUITS

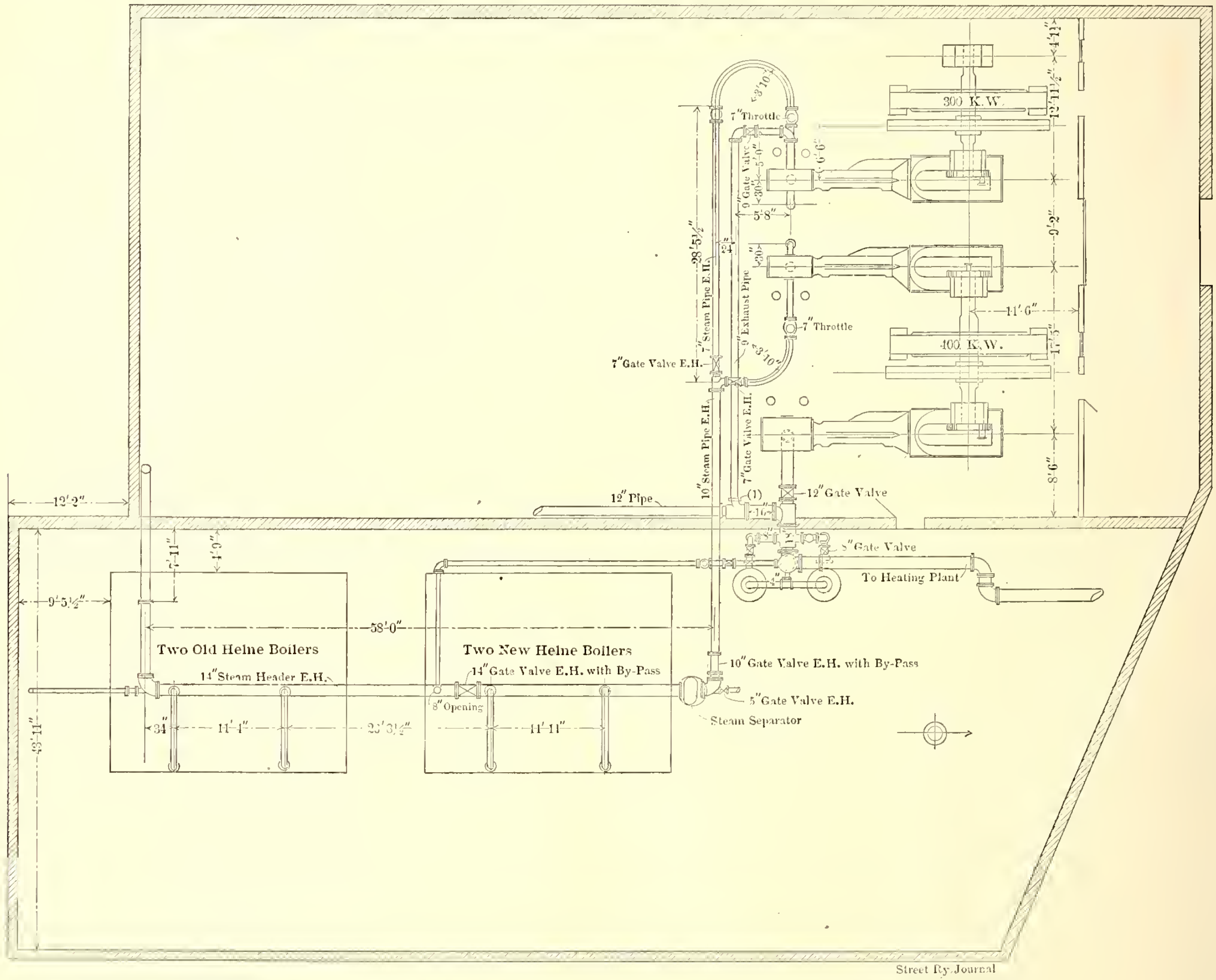
The plant has a capacity of 100,000 sq. ft. of radiation. The main pipes from the heaters are 10 ins. in diameter, and the side mains taper down to 8 ins. and 7 ins. They are laid in hemlock conduits, whose bottom consists of three 1-in. boards separated from each other by side pieces 1 in. thick. On this base the pipes are laid with similar side pieces placed on each side of them. The upper part of the conduit duplicates the construction of the lower. The present style of conduit, with mineral wool or oil shavings, has not proven entirely satisfactory, and in future construction the two-ply felt-packed casing, shown in the accompanying sketch, will be used. The average transmission distance is about three-quarters of a mile.

POWER STATION

In 1902 the company abandoned its old power station and belted generating sets for the direct-connected apparatus now in service at the new power house located in South West Street, which is in touch with two steam railroads. The extreme length of the building through its center is about 123 ft.; the width of the boiler room, 43 ft. 11 ins., and of the engine room, 52 ft. 2 ins. The brick stack, which is octagonal in shape, is 135 ft. high, 6 ft. 6 ins. internal diameter. The general layout of the machinery and piping is shown in the accompanying plan view of the engines and boilers, the connections to the heating system being also shown. Steam at 125 lbs. pressure is generated in four hand-fired Heine boilers, two of 400-hp and two of 300-hp each. There are two Excelsior feed-water heaters, one of 400-hp and the other of 600-hp capacity.

The 550-volt railway units are of 300-kw and 400-kw, respectively, of the Westinghouse type, and are direct connected a. c. system from the railway end of the plant; otherwise a small engine-driven exciter would have been necessary. The 150-kw 500-volt rotary converter previously mentioned is also used to furnish 250 volts direct current for commercial purposes.

The switchboard, which is built up of white Italian marble panels, is 22 ft. long, 7 ft. 6 ins. high and 2 ins. thick. The marble of all panels is composed of two sections each, the lower section 25 ins. high and the upper one 65 ins. The panels are supported by a 2½-in. angle-iron framework, securely bolted with 1½-in. wall braces and instrument transformer racks, and 1½-in. x 22-ft. angle iron rigidly supported on the rear wall, to which are bolted the nine switchboard braces.

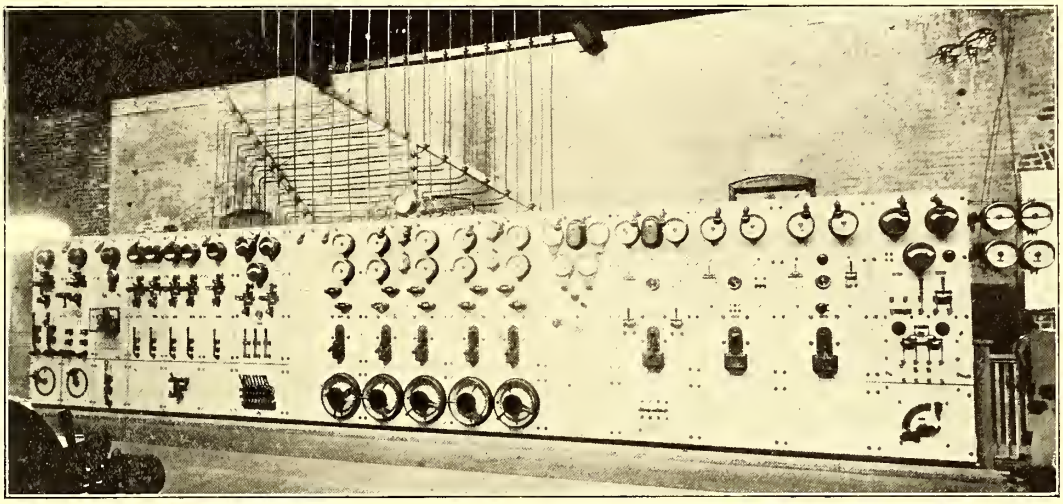


PLAN OF POWER STATION, SHOWING LAY-OUT OF BOILERS, GENERATING SETS AND PIPING

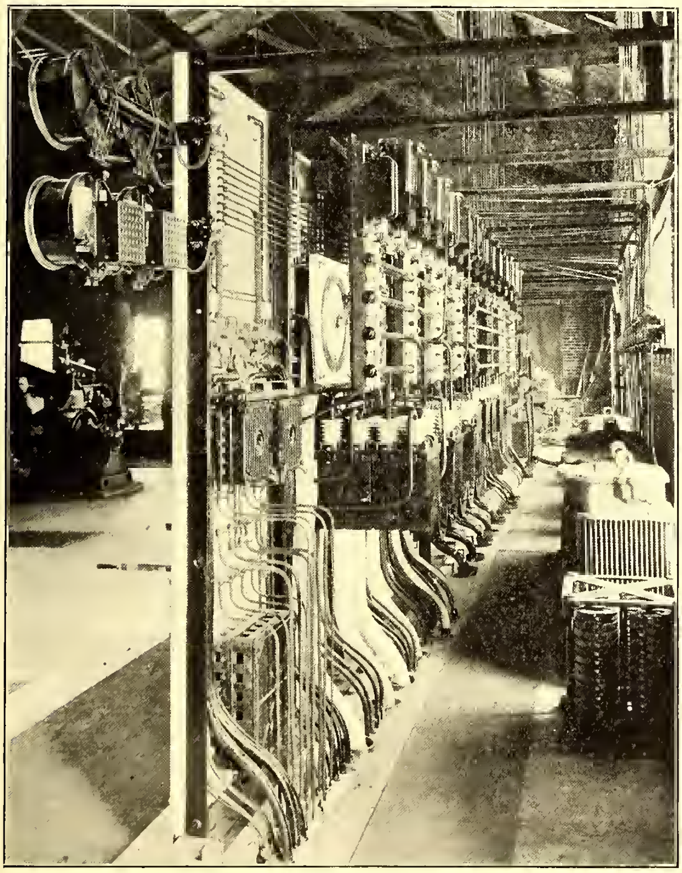
to St. Louis Iron & Machine Works' Corliss engines. The 300-kw generator is driven by a 28-in. x 48-in. engine running at 125 r. p. m., while the larger one is connected to a 26-in. x 48-in. engine running at 90 r. p. m. A 150-kw rotary converter is used to furnish additional direct current in emergencies.

For the lighting and power work the company has two revolving-field, 2200-volt, 60-cycle, two-phase Westinghouse generators, one of 300-kw and the other of 400-kw rating. The first unit is driven by a 20-in. x 42-in. St. Louis Iron & Machine Works engine running at 100 r. p. m., and the second by a 20-in. x 32-in. x 42-in. cross-compound engine of the same speed and manufacture. Current for the excitation of the fields of these alternators is furnished by a 45-kw exciter set, the generator of which is direct connected to a two-phase induction motor. In addition there is a 45-kw generator direct connected to a 500-volt motor, which is used only to start the

Panel No. 1, for the d. c. side of the 150-kw rotary, is equipped with two Weston round-type ammeters and one voltmeter, a Cutler-Hammer starting rheostat and the usual single-pole, single-throw switch, voltmeter plug and receptacle, pilot lamps, etc. The second panel is used for the control of two 50-amp. 2200-volt feeders, and is equipped with two 80-amp. ammeters, two 150-volt voltmeters, two Westinghouse O.D. series and two shunt transformers, two single-phase recording wattmeters, two double-pole, oil-type switches, two 50-amp. Stillwell regulators giving a voltage regulation of 10 per cent, and brackets, lamps, shades, etc. The third panel is employed for the control of two 100-amp. 2200-volt feeder circuits, and is equipped like panel No. 2, except that the instruments are of larger capacity. The fourth panel, which serves for the control of the total load, is furnished with a 150-volt voltmeter, a two-phase recording and a two-phase indicating wattmeter, shunt and series transformers, ground detectors, etc. The alternating-current side of the 150-kw rotary is controlled by the fifth panel, on which are mounted two 200-amp. ammeters, a two-phase wattmeter, starting motor, series transformers, etc. Panel No. 6, for the 400-kw arc generator, has two 200-amp. ammeters, one synchronizing and one power-factor switch, one generator oil switch of circuit-breaker type, one exciter switch, two series and two shunt transformers, etc. The 300-kw alternator is controlled by the seventh panel, which is practically a duplicate of panel No. 6. On the exciter panel, which is eighth and last, there are two double-pole, single-throw, 400-amp. switches, one single-pole switch of the same capacity, Weston round-type ammeters and voltmeter, one synchronizer, one power-factor meter and other details. The entire switchboard was furnished and installed by R. Haas Electric & Manufacturing Company, of Springfield, Ill., and all of the instruments, transformers and switches are of Westinghouse manufacture, except where otherwise mentioned.



FRONT VIEW OF SWITCHBOARD



REAR END-ON VIEW OF SWITCHBOARD

CAR HOUSE AND REPAIR SHOP

The present car house is located on North Park Street, while the adjacent building, which was formerly used for a power station, is used for storage. Although this structure is a substantial brick, tile-covered building, 110 ft. x 50 ft., no special shop tools have yet been installed, but it will probably be used as a repair shop ultimately.

ORGANIZATION

The administration which is responsible for the excellent public service offered by this company is composed of the following: A. E. DeMange, president; Hon. John Eddy, vice-president and general manager; J. F. Evans, secretary and treasurer; F. M. DeMange, manager of the heating and lighting department; C. F. Snyder, superintendent of the heating and lighting department; W. A. Irwin, superintendent of the railway department; C. H. Robinson, master mechanic of the railway department, and John Gray, chief steam engineer, who prepared the specifications for the concrete engine foundations, laid out part of the steam piping, and designed and supervised the construction of the large power house smokestack.

APPLE-BLOSSOM PARTIES ON THE ROCHESTER & SODUS BAY RAILWAY

The Rochester & Sodus Bay Railway, which is part of the Rochester Railway Company's system, is an interurban line operating between Rochester and Sodus Point, a distance of 41 miles. It runs through one of the richest fruit and garden sections in the State, and during the early part of May, when the apple blossoms are out, the line is advertised as the "Apple Blossom Route—40 miles of Apple Blossoms," etc. A regular car, holding from forty to fifty persons, can be chartered for this trip for $40, or single daily excursion tickets for 75 cents.

In the case of private parties, souvenir cards, decorated with apple blossoms and containing an eloquent invitation to see the real apple blossoms in all their glory, have been issued in one or more instances.

MORE PRIZES IN DETROIT

The Detroit "United Weekly," ever on the alert for opportunities to interest the public in the Detroit United Railways Company's interurban lines, has offered a prize of $25 to the boy or girl regularly attending school in any county traversed by the Detroit United Railway, for the best catalogue list of wild flowers to be found in these five counties. It is not necessary to designate the flowers by their scientific names. The list will be submitted to some well-known botanist who is to act as judge, and the prize will be given to the compiler of the list which is the most complete and accurate. Only the wild flowers native in the counties surrounding Detroit will be accepted on the list.

THE CAMERA IN ELECTRIC RAILWAY WORK

The possibilities of the camera as a valuable adjunct, not only to the claim department, but to the engineering departments as well, have been emphasized in these columns. Perhaps the photographic department of the Boston Elevated Railway Company presents as good an illustration as can be found of the value of systematically keeping photographic records.

On the Boston Elevated the photographic work is organized into a distinct department in charge of P. W. Rowell, who is an expert photographer, and who has also had an engineering training. He is therefore not only qualified to take good photographs, but is also able to tell what kind of pictures are wanted from an engineering standpoint.

FIG. 1.—VIEW OF DUDLEY STREET TERMINAL, USED IN ADJUSTING A TIME-LIMIT CONTRACT

The photographic department has well-equipped rooms on the top floor of the company's office building, and is supplied with all modern facilities for taking, developing, printing and enlarging work. Two sizes of photographs are taken as standard—i. e., 8 ins. x 10 ins., and 11 ins. x 14 ins. For the reference albums, blue prints are made from the negatives, as it is found blue prints stand the constant handling better than solio prints, and they are easier and cheaper to make. Each print bears a title, a number and the date it was taken. The prints are bound in stiff-cover albums on the loose-leaf system, and are classified and indexed by number and by subject. For instance, one album contains pictures of stations; another tracks; another rolling stock; another car houses and repair shops, and so on. The work of this department also includes reducing by photographic process tracings, maps, drawings, etc., to small sizes for convenient reference purposes. These reduced maps and drawings are printed on blue-print paper and are bound in albums similar to the photographs.

FIG. 2.—VIEW SHOWING SHANTY ON SEPT. 28, 1900

The systematic taking of record photographs was commenced before the present elevated or subway structures were started, and since that time about 4000 negatives have been made. The records include views of practically all the buildings along the line of the elevated just as they stood before work on the structure was commenced. These views have been of the utmost value in settling damage claims brought by abutting property holders. The photographs were also used by the architects in estimating the value of buildings that were torn down to make room for the elevated structure.

FIG. 3.—VIEW OF SAME LOCALITY AS FIG. 2, SHOWING SHANTY HAD BEEN REMOVED PRIOR TO OCT. 20, 1900

Starting with the time that the first ground was broken, the department has taken progress photographs of every detail of the work carried on by the engineering force, not only of new work, but also in connection with the regular routine work of the engineering department. The policy has been to take too many rather than too few pictures, and oftentimes photographs that were taken to show some particular detail have been used to excellent advantage in one way or another, as determining some entirely different matter, which perhaps was not thought of at the time the view was taken.

FIG. 4.—VIEW USED IN SUIT INVOLVING CONDITION OF A FENCE

The albums of photographs are in almost constant use by the entire engineering staff, and are looked upon as one of the indispensable "tools" of the office. The views are, of course, in frequent demand by the claim department, and it has now become the common thing for the claim department, when notice of a new accident or damage suit is received, to send to the photographic department with the query, "Have you any pictures covering this?" In this connection the placing of the date when the picture was taken on each negative so that it will print through on each print made has been found to be an important part of the record.

So much has been said concerning the value of photographic records that more than ordinary interest attaches to the accompanying views, which were picked from the collection in the files of the Boston Elevated Railway Company as presenting concrete examples of instances where considerable money was saved to the company on the evidence alone contained in the photographs.

For instance, the view of the Dudley Street terminal, reproduced in Fig. 1, was the means of settling a contract that saved to the company several thousand dollars—nearly enough to pay the expenses of the photographing department for an entire year. In this case the contractors were under a time limit to complete the steel work at this terminal and endeavored to set up the claim that their work had been completed within the specified time. By means of this and a series of similar progress views taken before and after the date in question, the Elevated Company was able to establish beyond dispute that not only was the work not completed on the date specified, but that it was still unfinished several weeks after the date.

Figs. 2 and 3 were the means of winning a suit in which a property owner claimed that the company had obstructed his property by maintaining in front of his store a wooden shanty for the use of the construction gang. The photograph reproduced in Fig. 2 showed the shanty in place on Sept. 28, 1900. The company then put in evidence the photograph shown in Fig. 3, which was taken on Oct. 20, 1900, at the same place, and proved beyond question that the shanty had been removed prior to the latter date. Inasmuch as the property owner claimed that the shanty had been maintained long after this date, the case was immediately decided in favor of the Elevated Company. In this instance both photographs had been taken for an entirely different purpose, but after notice of the suit had been received a search of the photographic records revealed the fact that their evidence on the point involved was conclusive as establishing that the company had not been negligent about removing the obstruction.

FIG. 5.—PHOTOGRAPH USED TO PROVE STATION STAIRWAYS WERE AMPLY GUARDED BY RAILINGS

In another case a small boy climbed through a high board fence and fell to some steam railroad tracks below. Suit for damages was brought against the Elevated Company on the grounds that the company had not properly maintained the fence. The company was relieved from the necessity of defending the suit upon presentation of the photograph, Fig. 4, and similar views, showing that the company had left the fence intact. Fig. 4 proved that there was no hole in the fence at the time it was responsible for its maintenance, and even showed the workmen completing the job.

FIG. 6.—PICTURE EXPLAINING SITUATION INVOLVED IN ASSAULT AND BATTERY SUIT

Fig. 5 was employed in defending a damage suit brought by a woman who fell down a flight of stairs in one of the subway stations. The plaintiff claimed the stairs were not protected and that the station was dark. The court immediately decided that the railings shown in the photograph were ample protection for the stairs, and that if there was sufficient light to take a photograph there must have been light enough to enable a person using reasonable care to see the steps.

Fig. 6 was involved in rather an amusing case. The Elevated Company was granted by legal process the right to make excavations adjoining the brick wall shown in the photograph. It seems the occupant of this building did not like the decision of the court and made every effort to obstruct the progress of the work. One day a laborer placed a long ladder (similar to the one shown in the picture) immediately beneath the small window visible high up in the wall. The workman had mounted to the top of the ladder to do some work when the occupant appeared at the window and threatened to push the ladder out into the excavation. The workman naturally did not relish the idea of the long fall, and in a spirit of self-defense struck the knuckles of the obstreperous householder a smart blow with a hammer. The householder then brought suit on the grounds that he had been assaulted in the window of his own house. The photograph made the whole situation so clear that the case was thrown out of court.

The steam roads out of Columbus have taken concerted action to compete with the electric roads out of that city. All but the Pennsylvania Company have agreed to meet the rates of the interurbans to competing points. The Pennsylvania officials decided that it would not be profitable to fight the interurbans.

THE ELECTRIC RAILWAYS OF RHODE ISLAND

The year 1904 was a favorable one for the electric railways of Rhode Island, and the reports from the several companies show a marked improvement in nearly every particular. There was an increase of about 20 miles of road and a corresponding increase in single-track mileage. Many new cars were added to the rolling stock. Nearly every road shows an increase in net earnings, and every road but one shows an increase in the number of passengers carried. The freight and express business has had a constantly increasing growth. Starting with a single car, this service has so grown that forty-five cars are now used in the business, and the receipts from this source last year aggregated nearly $100,000. There are several roads that do not have the right under their charters to carry freight, but they will probably have their charters so amended as to give them that privilege.

There are fifteen street railway corporations holding charters or doing business in the State; of these there are but ten that are operated under their charters, viz.: the Rhode Island Company, which owns, leases or controls the Union Railroad Company, the Pawtucket Street Railway Company and the Providence Cable Tramway Company; the Westerly & Hopkinton Railway Company; the Pawcatuck Valley Street Railway Company; Old Colony Street Railway Company of Massachusetts, which leases and operated the Newport & Fall River Street Railway Company; Sea View Railroad Company; Newport & Providence Railway Company; Rhode Island Suburban Railway Company; Providence & Danielson Railway Company; Columbian Street Railway Company, and the Western Rhode Island Railway Company.

These corporations report 341 miles of road in this State, with 369 miles of single track; this is an increase of 19 miles of road and of 18 miles of single track. The paid-up capital stock of all the roads is $21,607,100, an increase over last year of $1,971,200. They own 836 motor cars, 45 freight cars and 56 other cars; this shows an increase in motor cars of 128 and an increase in freight cars of 12, and a decrease in other cars of 21.

The total property and assets of these corporations are reported as $31,803,086.43, an increase over last year of $3,895,-182.02.

Dividends were paid by four of these corporations, as follows: Union Railroad Company, 8 per cent, $720,000; Pawtucket Street Railway Company, 6 per cent, $30,000; Newport & Fall River Street Railway Company (6 per cent on $750,000, paid directly to stockholders by Old Colony Street Railway Company, lessee), $45,000; Rhode Island Suburban Railway

TABLE SHOWING DATE OF ORGANIZATION, MILES ROAD, NUMBER OF MOTOR AND OTHER CARS, WITH TOTAL NUMBER OF PASSENGERS CARRIED FOR THE YEAR ENDING JUNE 30, 1904, AND INCREASE OR DECREASE OVER PREVIOUS YEAR.

NAME OF CORPORATION.	Date of Organization.	Miles Road in R. I.	Miles Single Track in R. I.	Open Cars.	Vestibule Cars.	Closed Cars.	Total Passenger Cars.	Other Cars.	Freight Cars.	Number of Passengers Carried.	Increase Over Last Year.
Union Railroad Co., Providence*	Feb. 2, 1865	134.89	147.26	247	113	130	490	44	15	....	....
Pawtucket Street Railway Co.*	July 18, 1885	28.81	30.77	18	......	26	44	......	......	....	....
Woonsocket Street Railway Co.	June 4, 1886	18.766	19.526	19	14	2	35	......	1	2,523,546	446,364
Providence Cable Tramway Co.*	July 24, 1884	2.92	3.29	......	......	......	......	......	1	....	....
Westerly & Hopkinton Railway Co.†	May 1, 1902	......	......	......	......	......	......	......	3	....	....
Pawcatuck Valley Street Railway Co.	May 25, 1993	6.15	6.23	6	......	2	8	1	1	394,354	6,556
Newport & Fall River Street Railway Co.‡	Jan. 1898	18.492	20.125	40	11	4	55	5	3	....	....
Old Colony Street Railway Co., in this State	Dec. 28, 1880	......	......	......	......	......	......	......	......	2,868,413	—6,723
Sea View Railroad Co.	July 28, 1887	18.04	18.72	8	5	......	13	1	2	946,356	93,660
Newport & Providence Railway Co.†	Dec. 12, 1902	11.981	12.646	6	3	......	9	2	......	46,327	46,327
Rhode Island Suburban Railway Co.	June 2, 1899	68.12	76.32	87	44	27	158	1	......	6,494,803	452,509
Providence & Danielson Railway Co.	July 7, 1893	24.11	25.203	6	18	......	24	2	19	1,256,869	390,058
Columbian Street Railway Co.§	May 23, 1895	9.256	9.456	......	......	......	......	......	......	642,329	139,180
The Rhode Island Co.	June 24, 1902	......	......	......	......	......	......	......	......	54,484,754	3,370,903
Western Rhode Island Railway Co.	May 7, 1903	......	......	......	......	......	......	......	......	....	....
TOTAL	....	341.535	369.546	437	208	191	836	56	45	69,657,751	4,938,834

* Leased to the Rhode Island Co. † Road not completed. ‡ Leased to and operated by Old Colony Street Railroad Co. § Rolling stock furnished by Woonsocket Street Railway Co. — Decrease.

TABLE SHOWING NAMES OF CORPORATIONS, CAPITAL STOCK PAID IN, FUNDED DEBT, FLOATING DEBT, TOTAL INDEBTEDNESS, TOTAL RECEIPTS, EXPENDITURES AND NET EARNINGS FOR THE YEAR ENDING JUNE 30, 1904.

NAME OF CORPORATION.	Capital Stock Paid in.	Funded Debt.	Floating Debt.	Total Indebtedness.	Receipts.	Expenses.	Net Earnings.
Union Railroad Co., Providence*	$9,000,000.00	$25,000.00	....	$25,000.00	$720,100.00	....	$720,100.00
Pawtucket Street Railway Co.,*	500,000.00	....	....	....	30,100.00	....	30,100.00
Woonsocket Street Railway Co.	300,000.00	170,000.00	138,807.49	308,807.49	102,619.02	104,713.49	—2,094.47
Providence Cable Tramway Co.*	300,000.00	....	....	....	....	....	....
Westerly & Hopkinton Railway Co.	100,700.00	....	....	....	....	....	....
Pawcatuck Valley Street Railway Co.	75,000.00	100,000.00	23,211.67	123,211.67	20,676.54	17,302.94	3,373.60
Newport & Fall River Street Railway Co.†	750,000.00	543,500.00	427,686.79	971,186.79	1,000.00	1,000.00	....
Old Colony Street Railway Co., in this State	....	....	....	....	250,504.70	173,483.44	77,021.26
Sea View Railroad Co.	700,000.00	550,000.00	64,908.55	614,908.55	56,051.68	31,934.24	24,117.44
Newport & Providence Railway Co.‡	10,200.00	....	....	....	2,731.10	1,697.80	1,033.30
Rhode Island Suburban Railway Co.	5,000,000.00	4,933,200.00	62,554.92	4,995,754.92	359,699.54	537,762.24	—178,062.70
Providence & Danielson Railway Co.	1,000,000.00	600,000.00	45,866.76	645,866.76	80,809.10	96,223.56	—15,414.46
The Rhode Island Co.	3,770,000.00	....	463,822.70	463,822.70	2,754,655.39	2,585,362.33	169,293.06
Columbian Street Railway Co.	100,000.00	....	57,331.23	57,331.23	32,474.62	27,631.54	4,843.08
Western Rhode Island Railway Co.§	1,200.00	....	3,474.64	3,474.64	....	4,674.62	—4,674.62
TOTAL	$21,607,100.00	$6,921,700.00	$1,287,664.75	$8,209,364.75	$4,411,421.69	$3,581,786.20	$829,635.49

* Leased to the Rhode Island Co. † Leased to and operated by the Old Colony Street Railway Co. ‡ Road commenced operation June 14, 1904. — Deficit. § Road not in operation.

Company, 2 per cent, $100,000; the total amount paid in dividends was $895,000.

The whole number of passengers carried was 69,657,751, an increase over last year of 4,938,834. One road reports a decrease in the number of passengers carried. The funded debt of all the corporations is $6,921,700; floating debt, $1,287,664.75; total indebtedness, $8,209,364.75. There is a decrease of $5,000 in the funded debt; an increase in the floating debt of $185,869.78; an increase in total indebtedness of $180,869.78.

GENERAL TROLLEY PASSENGER AGENT IN BOSTON

The Old Colony Street Railway Company and the Boston & Northern Street Railway Company, both of which are controlled by the Massachusetts Electric Companies, have established general passenger agent's headquarters at 309 Washington Street, directly opposite the historic Old South Meeting House. It is believed this is the first instance in the East of electric railway companies maintaining a city agency devoted exclusively to the furthering of the passenger business on trolley roads, although the idea has been followed out in Buffalo, Detroit, Cleveland and other cities in the Middle West. The Boston office will be in charge of Robert H. Derrah, who has had wide experience in the electric railway business and who is well known throughout New England as the publisher of "Derrah's Trolley Guide."

In announcing the opening of this office, the statement is made that in starting a passenger and advertising department in the downtown district of Boston, the management of the Boston & Northern and the Old Colony Street Railway companies believe that they have filled a long felt want. There has been for some time a constant demand on the part of the riding public, especially by those who are desirous of taking trolley trips, to know where one can go, how to go and how much it costs. It is to assist those who want to know about these pleasure trips that the office of passenger and advertising agent has been created.

The office has been well equipped with everything that could possibly be suggested to facilitate the knowledge of transportation by trolley. There are maps of all lines, time-tables for every car that leaves one of the company's car houses, many framed and unframed photographs of seashore resorts, parks, groves and picnic grounds, etc.

In outlining to a representative of the Street Railway Journal the plans for summer, Mr. Derrah explained that the Massachusetts Electric Companies now comprise two great systems extending from Nashua, N. H., through the entire

Swampscott

Westwood Park

Westwood Park

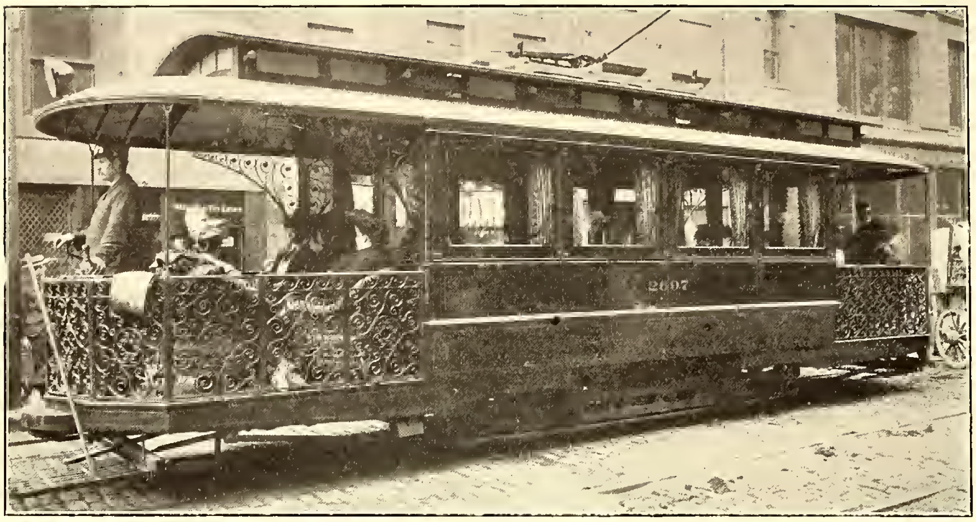
Salem Willows

Highland Park

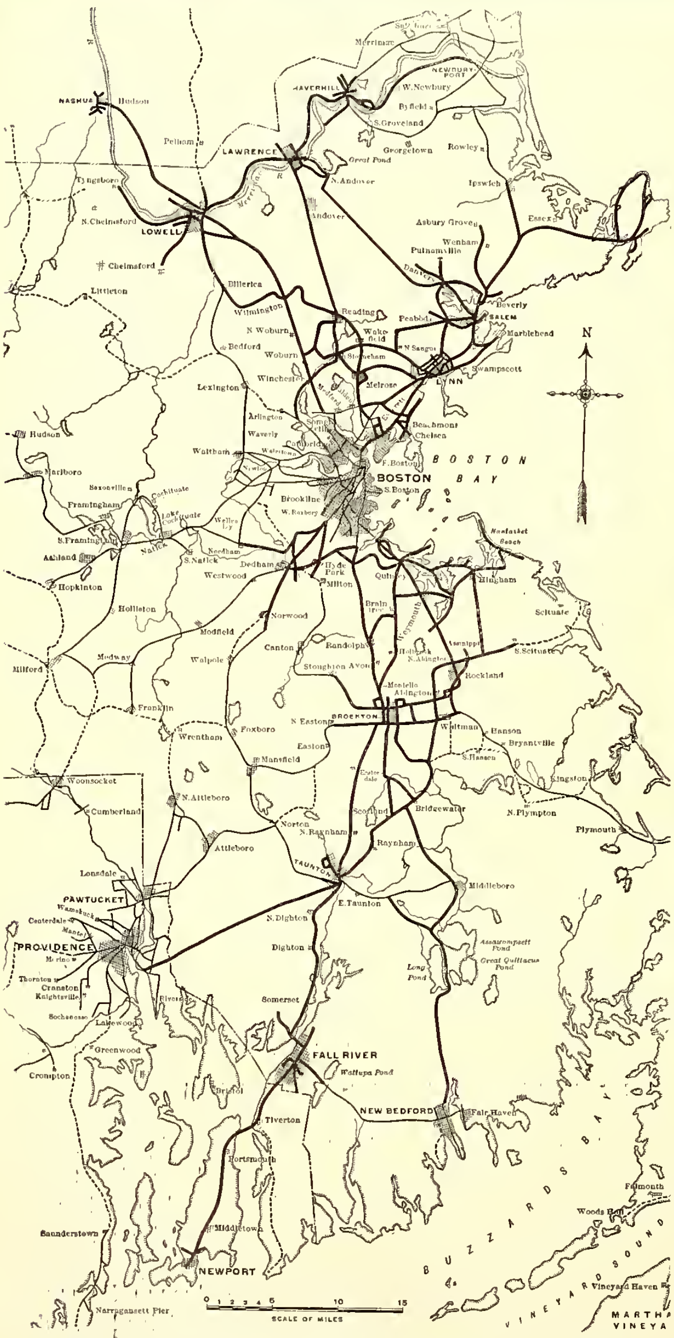
Entrance to Highland Park

TYPICAL VIEWS USED IN ADVERTISING LITERATURE, MASSACHUSETTS ELECTRIC COMPANIES

State of Massachusetts to Newport and Providence, R. I. In other words, the lines extend 45 miles north of Boston and 75 miles south, so it is evident that the new office will have a wide field to cover. One of the first moves will be the publication



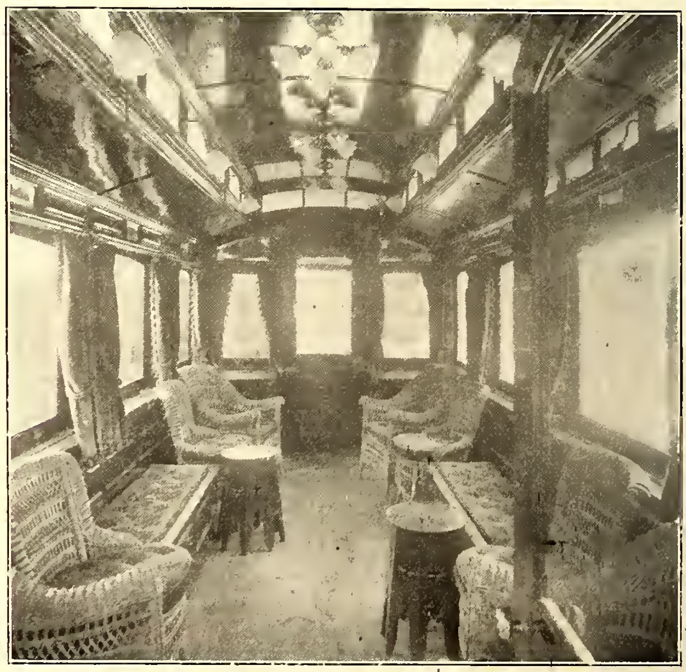
SPECIAL OBSERVATION CAR, MASSACHUSETTS ELECTRIC COMPANIES



MAP OF TERRITORY COVERED BY GENERAL PASSENGER AGENT'S DEPARTMENT, MASSACHUSETTS ELECTRIC COMPANIES

of six folders, which will be ready for distribution about May 30, together with other literature. The first of these folders is devoted to the parks, groves, seashore resorts and other places of recreation along the lines of the Boston & Northern and Old Colony Street Railways that are especially adapted for picnic parties and outings. This circular is prepared for placing before all sorts of organizations, as churches, public schools, Sunday-schools, social and political societies, athletic associations, etc., full information pertaining to the seashore resorts, pleasure groves, lakes and other places of interest along the lines of these two systems. A short description of each resort is included, together with a suggestion as to the sort of an outing for which it is best adapted. The various folders, as issued, will be distributed widely in Boston and over the territory covered. There are now being built 150 folder cases similar to the time-table racks of steam railroads, and these will be located in various prominent places. By means of these racks the literature will be distributed in hotels, drug stories, cigar stands, etc.

An important branch of the work will be the spreading of information concerning the letting of special cars for private parties, and it is believed this special car business will amount



INTERIOR OF SPECIAL CAR

to very large proportions. There has been placed at the disposal of the passenger agent a handsome new observation car, which is illustrated herewith, and which it is believed will be exceedingly popular during the coming season.

One of the methods by which public interest will be aroused will be the giving by Mr. Derrah of lectures illustrated with stereopticon views before business men's associations and other organizations in the cities and towns served by the trolley lines. This lecture will bring forcibly to the attention of the public the historic places and beauty spots that can be seen from the trolley cars. Several of these illustrated talks have been given and have proven exceedingly popular. Mr. Derrah also makes it a point to have frequent talks with the conductors and motormen at their various social and business meetings, and he explains to them how they can help the business by pointing out to visitors the various features of interest on their divisions. At these talks to employees, Mr. Derrah brings to their attention all the old houses, landmarks, historic trees and other features associated with the history or literature of the country and the lives of famous people, and as a result it is found the conductors and motormen frequently take considerable trouble to inform the passengers as to the best things to see and the best ways to reach them.

In order to attract general attention and awaken public interest in the beauty spots in the territory served by the trolley lines, the companies announce a unique photographic contest, open to amateurs only. Through Mr. Derrah's office, the management offers liberal prizes in cash and goods to those sending in photographs having real artistic merit and which show the most attractive spots reached by the lines. The only conditions are that the photographs must not be less than 4 ins. x 5 ins., nor larger than 8 ins. x 10 ins., and they must be printed on matte surface paper and mounted, and on the back of each must be plainly marked the location of the view and the name and address of the sender. Three photographic experts, well known in photographic circles in Boston, have consented to act as judges. The contest will close on Sept. 1, 1905. The prizes for the best photographs are as follows:

First prize, $50 in cash.

Second prize, a Lovell diamond bicycle, for lady, gentleman, boy or girl.

Third prize, leather-cushioned arm chair.

Fourth prize, an Eastman folding pocket kodak.

Fifth prize, tennis racket and case and one dozen tennis balls.

A feature of the general passenger agent's office will be the collection of photographs in frames and in albums. These views have been carefully selected to show scenes and objects of especial historic interest in Eastern Massachusetts. The teachers of the public schools in Boston are teaching the children about these places, and Mr. Derrah has extended an invitation to all the schools to bring the children to the office and let them study the photographs. It is believed this privilege will be appreciated and it will undoubtedly lead to the teachers taking the scholars to see the places represented by the pictures.

REMARKABLE ACCIDENTS IN CLEVELAND

Two remarkable accidents occurred in Cleveland recently. On Saturday morning, May 13, a limited car on the Lake Shore Electric Railway was derailed on the Rocky River viaduct, west of the city, and crashed through the rail. Here it hung suspended over the side of the bridge, miraculously escaping a drop of 100 ft. to the river bank. The height of the bridge and the dangerous position of the car are best explained by the accompanying illustration. The car was tilted at an angle of 60 degs., and the fact that one corner struck a trolley pole was all that saved it. Sixteen passengers were removed, none of whom was injured. So precarious was the position of the car that President Warren Bicknell, of the company, who was at the scene of the accident, refused to allow the crew to board the car to remove the passengers' baggage. Considerable difficulty was experienced in saving the car, and the track was cleared only after thirty-six hours of work.

Within twenty-four hours of this accident, a car on the Akron, Bedford & Cleveland line jumped the track on the Humboldt Street viaduct. The rear trucks left the track and that end of the car swerved around and crashed through the railing. Like the Lake Shore car, it hung suspended at great height. The sixty passengers had to emerge through the motorman's cab. No one was injured.

Careful investigation has failed to reveal the cause of either of the accidents, so the officials of the roads claim. In the case of the Lake Shore accident, the track was laid at the side of the bridge, the car having less than 2 ft. of clearance from the bridge rail. This construction was in compliance with a location assigned by the County Commissioners, and against which the railroad protested. The track was laid with a Boston section grooved rail, and there was no guard rail except a 4-in. x 6-in. oak guard rail for the bridge. The cars are fitted with

AKRON, BEDFORD & CLEVELAND CAR ON VIADUCT

steel tires, with a 1⅛-in. flange, and the indications are that the wheels ride on the flange on this track, and it is thought that a pebble in the groove was the cause of the derailment. The car was moving not to exceed 5 m.p.h.

The other accident was even more mysterious. There are double tracks in the center of the roadway. The space at the side of the track is 12 ft., and there is a 5-ft. sidewalk 6 ins. above the roadway. An 8-in. 80-lb. T-rail is used on the bridge, which is paved with block, and there is a guard rail adjoining the track rail. On the approach to the bridge a grooved rail is used. It was on these rails that the rear

VIEW OF LAKE SHORE CAR FROM RIVER

trucks of the car left the track. It then jumped over the sidewalk and carried away 10 ft. of the railing. The front trucks remained on the track. The only explanation offered is that a bolt or some hard substance dropped in the groove of the rail and then bounded out again after the car had been derailed, for no clue could be found after the accident. In neither instance was the track found to be out of gage.

A touring car service has been started by the Birmingham Railway & Light Company. These tours are made at 9 a. m. and 3 p. m. each Tuesday and Wednesday. They last three hours, and enable everyone who makes the trip to see a great deal, if not all, that is interesting in the Birmingham district.

ELECTRICITY ON STEAM RAILROADS*

BY CLEMENT F. STREET

At the present time the demands of heavy suburban service are beyond the capacity of the steam locomotives, and the indications are that within a few years a large proportion of this service will be handled by electric equipment. The next class of service in which it will be introduced is for the operation of pushers on heavy grades, and from this and suburban service, extensions will undoubtedly be made to entire divisions and trunk lines. The extensions to trunk lines will not be made in the near future, as the heavy expenditures and the engineering problems involved will retard this development, but when traffic conditions demand the change it will be made.

ELECTRICITY FOR SUBURBAN SERVICE

The proper handling of suburban service of steam railroads is probably receiving more attention than ever before. In the past there has been a tendency to look upon this service as a necessary evil and any solution of the problem of making it pay a hopeless task. There have been good arguments in favor of assuming this attitude, but the conditions have changed, and it is believed at the present time suburban traffic is attractive as a possible source of revenue. One of the changes which has taken place is the elimination of a large portion of purely local traffic which has been mixed with it, and which is undesirable if it must be handled on the same tracks and with the same cars as the suburban. The electric street railways have taken over practically all of this local traffic, and as they are built primarily for the purpose of handling it, it is their legitimate field. With this eliminated, the suburban lines can introduce schedules and equipments designed for purely suburban traffic and handle it efficiently.

Some of the benefits which are derived from this change are as follows:

Increase in gross receipts.
Better application of power to trains.
Increased capacity of terminals.
Reduction in operating expenses.
Reduction in terminal costs.
Reduction in cost of maintenance of equipment.
Increased reliability of service.

INCREASE IN GROSS RECEIPTS

When the steam locomotive is abandoned in a suburban service it will be for the reason that it cannot meet the demands of that service. The conditions which exist in our large cities are constantly increasing these demands, and even the best is never quite good enough. It needs no argument to prove that a better suburban service can be given with electric than with steam equipment, and all records show that the introduction of electricity is followed by a large increase in gross receipts.

All suburban traffic is competitive in one way or another. If a territory is served by only one road, that territory comes into competition with some other territory, and the one having the best service will build up more rapidly. The road giving the best service will therefore receive not only a greater proportion of the existing traffic, but will also secure an increased revenue owing to traffic arising from the building up of the territory through which it runs.

APPLICATION OF POWER TO TRAINS

A system of traction having power units attached to the trucks of the cars is desirable for suburban service for the following reasons:

(1) A high rate of acceleration can be obtained.

(2) A change in the weight of a train does not cause a corresponding change in the rate of acceleration.

(3) The rate of acceleration can be changed to suit different conditions.

(4) Switch engines are not required.

(5) Draw-bar strains are distributed.

These are all important in the operation of suburban service, and therefore it is not believed that any system of locomotives or other single power units will ever again be extensively introduced into this class of traffic. Diagrams Figs. 1 and 2 illustrate the relative accelerating power and flexibility of the two systems. Diagram No. 1 represents approximately the change which was made in the equipment used on the Manhattan Elevated when electricity was introduced. The steam locomotive formerly used on this road weighed about 24 tons and the cars about 20 tons. The electric equipment weighs about 7 tons, the motor cars about 27 tons, and the trailers 20 tons. The draw-bar pull of each system is computed as 25 per cent of the weight of the locomotive and motor cars. This rating shows a draw-bar pull of 12,000 lbs. for the locomotive, which, of course, remains constant regardless of the weight of the train. The draw-bar pull of one motor car is 13,500 lbs., which gives 27,000 lbs. for a three-car train having two motor cars, and 54,000 lbs. for five-car, six-car and seven-car trains, each of which is run with four motor cars.

The lower curve of Diagram No. 1 shows a comparison of the draw-bar pull per ton of train, with steam and electric equipment. From this diagram it will be seen that this figure for a three-car train with steam equipment is 142.8 lbs. per ton, while with the seven-car train it falls to 73.1 lbs. per ton. With electric equipment, a three-car train has a draw-bar pull of 364.8 lbs. per ton, and seven-car train, 329.2 lbs. per ton.

The cars in use on the Manhattan Elevated are much lighter than those in general use for the suburban service of steam railroads, and an indication of what can probably be done in the equipment of these heavy cars is given in the adjoining diagram (Fig. 2), where a comparison is given between locomotives weighing 100 tons, hauling cars weighing 35 tons, and motor cars weighing 51 tons with trailers weighing 35 tons. Under these conditions it will be seen that with a nine-car train the draw-bar pull is 50,000 lbs. with a steam locomotive and 127,500 lbs. with electric motors. With electric equipment it is assumed that five motor cars will be operated with a nine-car train, but it may be found better practice to use six motor cars with a train of this weight, and under this condition the electric equipment will have a still greater advantage.

The total weight of train as shown in Diagram 1 is very nearly the same for both systems, but when heavier equipments are used, as shown in Diagram 2, the electric equipment has a considerable advantage. With three-car and four-car trains the difference is 68 tons, with five-car trains, 52 tons, and with six-car trains, 36 tons. A large proportion of suburban service is handled in trains of from five to seven cars, and a considerable number of three-car and four-car trains are operated in this class of service. In view of this fact, this saving in dead weight is important.

INCREASED CAPACITY OF PRESENT TERMINALS

The introduction of electricity is followed by an increase in the capacity of existing terminals for handling trains. During the rush hours of the day these terminals are generally very much overcrowded. There is unavoidably a considerable amount of confusion, dirt and noise, owing to the presence of locomotives, each of which will, in spite of all precautions against it, discharge some smoke and cinders.

When a train enters a terminal the usual procedure is—after the passengers leave the cars—for the locomotive to be disconnected, a switch engine attached to the train, the train hauled to the yard and the locomotive switched to the roundhouse. This requires from five to seven switching operations. When a train is made up, it is, as a rule, hauled to the depot

* Abstract of a paper read at the May (1905) meeting of the Western Railway Club.

by a switch engine and the locomotive afterward attached. In some places, where terminals are very much congested, the road locomotives haul their own trains to and from the depot, and where this is done the train must be made up in the yards, where a corresponding number of switching movements take place.

Trains handled by electricity require only one or two switching movements for accomplishing the results outlined. On these trains the motorman merely carries his operating lever from one end of the train to the other, and the throwing of one or two switches is the only operation required for fitting the train for a run in the opposite direction. The making up of trains and hauling of them to the depot can be performed entirely by the motor cars themselves, and switch engines for this work can be dispensed with.

The rapid acceleration of electric trains is another feature which increases the capacity of terminals, as it enables a more rapid movement of trains than that obtained by the use of switch engines.

REDUCTION IN OPERATING EXPENSES

All records show that a reduction can be made in the cost of conducting transportation by the introduction of electricity, but it is difficult to secure figures which will enable an exact analysis of each of the items which go to make up this saving. The reduction in the cost of the train crew, however, can be obtained by making a very few figures in connection with any specified service. Figures regarding the cost of caring for equipments at terminals show interesting comparisons, and therefore some of them will be given.

For the care of locomotives at terminal points, roundhouses must be installed and maintained, and as these structures must be of a permanent character, their first cost is high.

There is such a variation in the first cost of these plants that it is impossible to give even an approximate estimate on this subject. The cost of operation, however, is easily obtained, but there is a wide variation which is governed by the conditions. At one roundhouse where 3900 locomotives are handled per month, the cost is $1.35 per locomotive; at another point where 1134 locomotives are handled per month, the cost is $1.97 per locomotive; at another point where 2750 locomotives are handled per month, the cost is $1.38 per locomotive; at another point where 3100 locomotives are handled per month, the cost is $1.20 per locomotive; at another point where 1500 locomotives are handled per month, the cost is $1.75 per locomotive. The average being 2476 locomotives per month at $1.53 per locomotive.

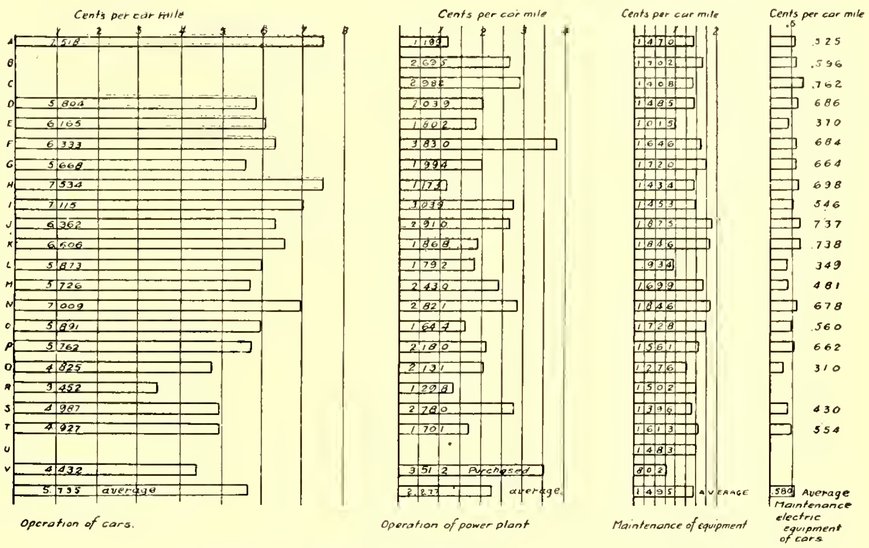


FIG. 3.—OPERATING COSTS OF TWENTY-TWO ELECTRIC RAILWAYS

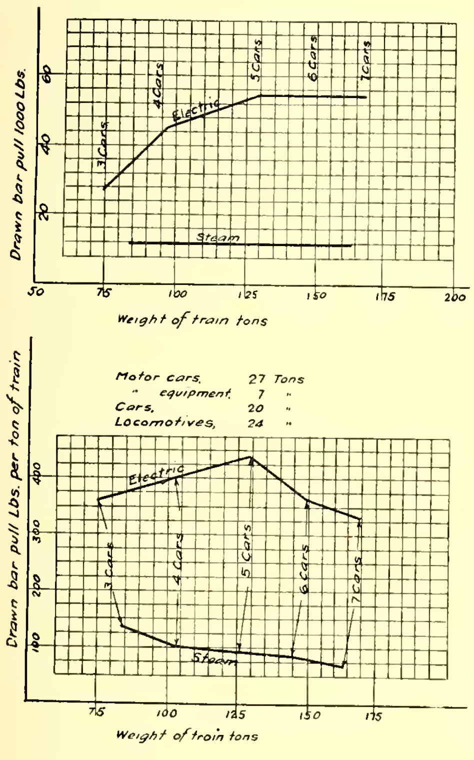


FIG. 1.—DIAGRAMS FROM MANHATTAN ELEVATED

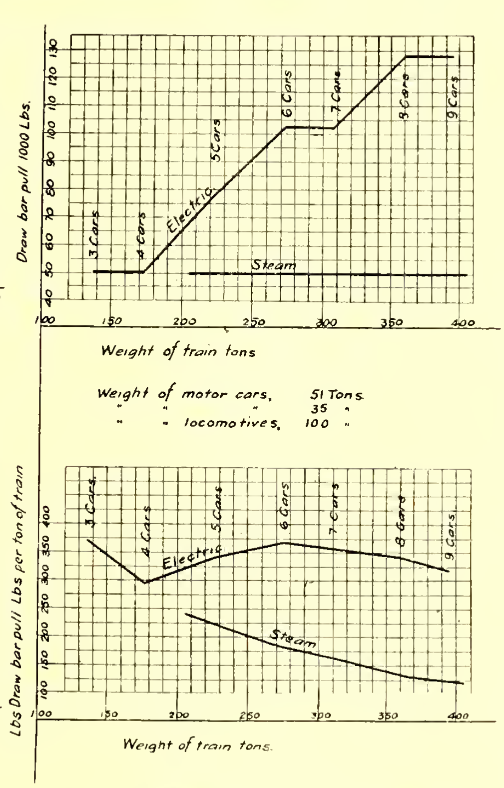


FIG. 2.—DIAGRAMS OF HEAVY TRAINS

The above figures do not in any case include the cost of removing ashes from the cinder pits, cost of handling coal, or the cost of supplying sand and operation of the sandhouse, or the cost of steam heat and water. These figures refer in all cases to the cost during comparatively warm weather, and also at point where fairly good water is obtainable and only a small number of boilers are washed. At points where bad water must be used, and at these same points during winter months, when snow and ice must be removed, these costs are higher.

With electric cars the terminal costs are reduced by about 60 per cent and the investment in buildings and equipment reduced by 80 per cent or 90 per cent. The following table gives a general outline of about what is accomplished in this direction:

Roundhouse—Eliminated.
Cinder Pit—Eliminated.
Washing Boilers—Eliminated.
Cleaning Flues and Grates—Eliminated.
Packing Cellars—Eliminated.
Firing Up Engines—Eliminated.
Turntable Expenses—Eliminated.
Wiping—Practically eliminated.
Sandhouse Expenses—About equal.
Water Supply—Practically eliminated.
Coal Trestles—Eliminated.

The arrangements made for handling of coal and ashes transferred to the central power house, but owing to the better facilities installed, the cost of doing the work can be reduced.

On two elevated roads the practice is to make an inspection of each car before it enters the service in the morning. After it has run about half a mile an inspector boards the car and questions the motorman regarding the operation of each portion of its equipment. Motor cars in constant service make an average of 220 miles per day, and after they have run about 50,000 miles are taken into the shop and thoroughly overhauled.

The cost of labor for making inspection under each system as above outlined, and also light running repairs, is from 20 cents to 25 cents per motor car per day. Assuming that six-car trains can be operated by one locomotive or by three motor cars, this gives a terminal cost of about 65 cents for electric equipment and $1.53 for locomotives. Where heavy service is being operated, this difference amounts to from $30,000 to $40,000 per year which is saved by the adoption of electricity.

MAINTENANCE OF EQUIPMENT

It is practically impossible to secure any figures which will give an absolute comparison between the cost of maintaining a steam and electrical equipment, as there is such a wide variation in the manner in which records are kept. As a rule, the records of the cost of maintenance of electrical equipment are much more complete than those of steam, and as this is a matter in which steam railroad men are vitally interested, some figures taken from these records will be given. The accompanying diagram (Fig. 3) gives figures which have been compiled from the reports of twenty-two electric roads, four of which are elevated and the remainder surface lines.

It will be noted that the average cost of maintenance for electric equipment of cars per car-mile is only .580 cent, which is only 4.33 per cent of the total cost of operation. This cost includes the maintenance of electric heaters and electric lights, which are used on nearly all of the roads from which these records have been taken.

There is a wide variation in the cost of operation of power plants per car-mile, which, it will be seen, varies from 1.173 cents up to 3.830 cents, with an average of 2.277 cents. This variation is due largely to the conditions under which the different power houses are operated. The lowest costs are for plants having a number of separate units, and when these units are in use they are usually worked to their full capacity. One of the roads for which this item is high purchases all of its power, but another one showing a low cost is following the same practice. Nearly all of the roads purchase a portion of the power used.

The costs given for maintenance of equipment include the maintenance of steam plant, electric plant, cars, electric equipment of cars and shop expenses. In the majority of cases the two largest items which go to make up this cost are the maintenance of the cars and the maintenance of the electric equipment of cars. The cost of maintenance of the steam plant and the electric plant is so low as to be of very little importance. The general manager of one of the roads states that the total cost of repairs to three generators of 1500-kw and three of 800-kw capacity during the year 1904 was less than $700.

All railroad men know that there is such a great variation in the conditions on different lines that it is impossible to draw conclusions from a comparison of the records of costs of the same operation on two different systems, and this variation extends to different points on the same system. The variation between the conditions of operation and character and weight of equipment on electric street railways and on steam railroads is greater than between any two steam railroads, and there is also a wide variation in the systems of keeping accounts. It is therefore impossible to find any basis upon which to make a comparison between the cost of maintaining the two classes of equipment, but merely as a matter of general interest Table No. 1 is presented. It will be noted that it includes the average cost of maintaining 224 sleeping and parlor cars, 40 private and hotel cars and 62 dining cars. The cost of maintaining this class of equipment is necessarily high, and therefore brings up the average to figures considerably above that of maintaining passenger cars alone. On the other hand, it includes 2042 baggage, mail and express cars, which would have a tendency to reduce the average figure.

Even after all of the variable features are taken into consideration, it is still interesting to note that the average cost of repairs and renewals per year for these cars is nearly three times as great per car as the average cost for maintaining steam plant, electric plant and cars on electric lines. In considering these figures it must also be borne in mind that in the costs given for repairs and renewals of cars and locomotives on steam railroads, a portion of the expenditure is for the building of new equipment, which should not justly be charged to repairs. This is owing to the peculiar system of bookkeeping which is known to exist on some steam railroads.

The figures given for the cost of repairs and renewals to locomotives per year are believed to be a fair average. It is generally understood that the introduction of heavy locomotives which has taken place during the past few years has increased this cost to figures which are somewhat startling. The records of some roads for the year 1904 give the cost of repairs and renewals per locomotive per year at from $3,500 to $3,700.

An item of considerable consequence in connection with the maintenance of steam locomotives is the fact that each one of them must receive heavy repairs on an average of about every

TABLE NO. 1.—COST OF REPAIRS AND RENEWALS OF CARS AND LOCOMOTIVES ON STEAM RAILROADS

	Parlor and Sleeping Cars.	Private and Hotel Cars.	Dining Cars.	First-Class Passengers.	Second-Class Passengers.	Combination Baggage and Passenger.	Baggage, Mail and Express.	Total.	Av. Cost Rep. & Ren. per Car per Year.	Number Locomotives.	Av. Cost Rep. & Ren. per Loco. per Year.
1	......	5	21	976	267	206	628	2,103	$794.65	1,763	$2,066.65
2	143	4	5	1,249	......	257	277	1,935	480.00	983	1,535.42
3	9	7	......	953	8	240	357	1,574	507.07	989	1,164.18
4	2	8	14	496	11	112	262	905	773.46	1,072	2,372.14
5	12	9	11	214	45	20	145	456	1,051.62	601	3,392.87
6	3	......	6	239	11	70	162	491	780.91	765	2,673.57
7	45	4	......	474	......	85	60	668	273.02	186	1,346.37
8	10	......	......	80	15	24	32	161	600.12	149	1,920.54
9	......	1	......	25	22	15	57	120	865.52	162	1,737.62
10	......	2	......	69	2	5	25	103	928.45	146	2,920.84
11	......	......	3	41	9	1	19	73	634.63	166	2,767.64
12	......	......	......	59	......	13	......	72	235.45	15	2,378.11
13	......	......	2	41	11	8	18	80	608.87	231	1,790.21
Total	224	40	62	4,916	401	1,056	2,042	8,741	......	7,228	....
Average	......	......	......	......	......	......	......	......	$729.57	......	$2,212.88

twelve months, and as the making of these repairs requires a period of from thirty to forty days' time, a locomotive is only available for service about nine-tenths of the period of its existence. This results in the tying up of large sums of money without earning power.

Electrically-operated cars have a material advantage over the steam locomotive in this regard. The records show that only 2½ per cent to 3 per cent of the trucks are out of service for heavy repairs, but this is not the controlling feature of the availability of the equipment for service, as from 5 per cent to 6 per cent of the car bodies are usually out of service for painting and varnishing. The practice is, therefore, to have 2 per cent or 3 per cent more car bodies than trucks, and when a body is taken to the shop for painting and varnishing, the trucks—if they are not in need of heavy repairs—are kept in service under another body. The trucks are all interchangeable, so that in case one of them needs repairs it can be replaced by another and the car retained in service. The time required in well-equipped shops for removing a truck and putting another one in its place is from thirty to forty-five minutes. This makes an extremely flexible system and one under which a large percentage of the equipment can be kept in continual service. The parts of electric equipment which wear out and require renewal are so few in comparison with those on a locomotive that neglect in keeping up repairs does not result in a corresponding deterioration in its condition.

The records of maintenance of electric line per mile per year shows an average of $149.11 for eighteen different roads. Some of these are operating a portion of their cars through suburban districts, and all of them operate through large cities where

TABLE NO. 2.—ANALYSIS OF OPERATING EXPENSES IN PER CENT—ELECTRIC RAILWAYS

ROAD.	Column 1. Way and Structures.	Column 2. Maintenance Equipment.	Column 3. Cost of Power.	Column 4. Operation Cars.	Column 5. General Expense.	Column 6. Operating Cost Per Cent. of Earnings.	Column 7. Maintenance Electric Equipment of Cars.	Column 8. Maintenance Electric Line.
A	7.09	9.46	7.690	56.990	18.770	53.13	3.370	2.839
B	......	......	15.247	......	......	69.07	3.427	1.920
C	......	......	18.844	......	......	63.74	4.819	1.803
D	2.363	12.400	17.030	48.450	19.740	75.06	5.730	1.249
E	6.480	8.500	15.160	51.700	18.160	60.12	3.100	1.495
F	6.984	10.154	23.914	39.990	18.962	67.36	4.173	1.337
G	13.030	13.258	15.364	43.874	14.474	68.55	5.130	3.057
H	7.871	10.159	8.805	53.613	19.802	71.94	4.950	1.829
I	11.164	9.162	19.163	40.975	19.536	86.39	3.446	2.564
J	10.117	12.433	19.301	42.071	16.078	73.79	4.887	2.715
K	6.408	14.176	14.123	50.736	14.552	55.35	5.667	2.012
L	6.967	8.393	15.966	52.299	16.375	61.03	3.116	1.584
M	10.207	12.996	18.732	47.278	10.787	76.99	3.585	2.374
N	10.146	12.655	19.218	47.457	10.514	78.00	4.593	2.168
O	10.127	14.117	13.284	47.587	14.885	68.70	4.528	2.311
P	5.674	13.447	18.251	43.380	14.284	58.00	5.573	2.451
Q	5.895	11.245	18.783	42.523	21.554	65.07	2.745	2.280
R	7.500	14.651	12.310	32.906	32.633	55.20	.....	.....
S	5.720	11.418	22.632	40.705	19.525	62.13	3.521	2.201
T	4.382	14.416	15.441	45.845	19.916	59.86	4.950	1.576
U	4.869	12.967	......	......	......	59.80	.....	.....
V	6.146	8.067	34.336	43.326	8.125	55.80	.....	.....
Average	7.457	11.704	17.314	45.879	17.298	65.72	4.332	2.093

Column 1 includes: Maintenance of track and roadway, electric line, and buildings and fixtures.
Column 2 includes: Maintenance of steam plant, electric plant, cars, electric equipment of cars, miscellaneous equipment and shop expenses.
Column 3 includes: Power plant wages, fuel for power, water for power, lubricants and waste, miscellaneous supplies and hired power.
Column 4 includes: Superintendence of transportation, wages of conductors and motormen, wages miscellaneous car service employees, wages of car house employees, car service supplies and miscellaneous expenses, hired equipment, cleaning and sanding of track and removal of snow and ice.
Column 5 includes: Salaries of general officers and clerks, printing and advertising, damages, legal expenses, rent, insurance and miscellaneous expenses.

TABLE NO. 3.—ANALYSIS OF OPERATING EXPENSES IN PER CENT—STEAM RAILROADS

ROAD.	Column 1. Maintenance Way and Structures.	Column 2. Maintenance Equipment.	Column 3. Conducting Transportation.	Column 4. General Expenses.	Column 5. Operating Cost Per Cent. of Earnings.	Column 6. Repairs and Renewing Locomotives	Column 7. Repairs and Renewing Cars.	Column 8. Fuel for Locomotives.
1	19.636	20.350	56.755	3.259	75.84	6.821	3.121	9.529
2	17.870	11.980	67.470	2.680	78.95	4.310	2.657	16.690
3	15.133	13.109	68.431	3.327	76.43	4.750	3.292	19.558
4	12.876	19.438	64.259	3.427	*136.00	9.804	2.698	10.898
5	29.532	17.775	50.883	1.810	77.006	8.354	1.964	9.553
6	21.627	24.713	50.405	3.255	73.38	10.775	2.020	11.820
7	15.369	12.377	68.738	3.516	78.83	5.228	3.809	13.729
8	21.000	18.868	56.566	3.566	73.78	6.476	2.186	12.595
9	25.611	20.375	50.783	3.231	58.21	5.897	2.176	11.467
10	28.224	23.685	46.065	2.026	101.27	8.389	1.881	9.948
11	19.722	15.886	62.553	1.839	80.46	7.450	.751	13.180
12	15.680	14.220	64.743	5.357	65.66	9.065	4.326	10.287
13	12.704	23.573	60.075	3.648	59.33	9.861	1.161	7.608
14	29.850	11.790	50.720	7.640	65.67	3.747	1.666	10.986
15	19.230	16.980	55.940	7.850	85.05	7.267	2.317	9.395
16	24.200	15.390	54.100	6.310	81.22	6.215	1.277	10.251
17	19.710	13.850	58.180	8.260	74.93	5.864	2.112	10.630
18	21.730	18.120	53.600	6.550	77.47	7.434	1.839	8.118
Average	20.539	17.355	57.791	4.308	75.50	7.094	2.291	11.457

*Not included in average.
Column 1 includes: Maintenance of roadway, rails, ties, bridges, fences, buildings, docks and telegraph lines
Column 2 includes: Repairs and renewals of locomotives, cars, marine equipment, shop machinery and tools.
Column 3 includes: Superintendence, engine and round-house men, fuel, water, oil and waste, train service and supplies, switchmen, flagmen and watchmen, telegraph and telephone, station service and supplies, car mileage, damages, wrecks, operating marine equipment, advertising, agencies, elevators and stockyards, rents and stationery.
Column 4 includes: Salaries of general officers and clerks, general office expenses, insurance and law expenses.

they must contend with a complication of telephone and telegraph wires, also crossings and curves which necessitate a complication of guy wires. The cost of maintaining an electric line on a private right of way is lower than the average figure here given. For heavy service catenary cables are used for suspending the trolley wire, which further decreases this cost. It will be noted from the table that the cost of maintaining an underground conductor is $960.39 per mile per year, and owing to this high figure it is not included in the cost of maintaining overhead conductors.

The fact that the percentage of earnings required for operating electric lines is lower than that required for steam railroads is frequently commented on, and therefore comparisons shown in Tables 2 and 3 will be of interest.

Table No. 2 shows the percentage of earnings required for operation, and the percentage of total operating costs required for the maintenance of equipment, cost of power plant, cost of cars, maintenance of way and structures, general expenses, maintenance of electric equipment and maintenance electric line on twenty-two different street railway lines.

Table No. 3 gives the percentage of earnings required for operation on eighteen of our largest steam railroads. This table gives the percentage of operating expenses required for maintenance of way and structures, maintenance of equipment, conducting transportation, general expenses, repairs and renewals of locomotives, repairs and renewals of cars, and fuel for locomotives. On the steam railroads the maintenance of equipment represents 17.355 per cent of the total cost of operation, while on the electric lines this represents 11.704 per cent. On the steam railroads the repairs and renewals of locomotives represent 7.094 per cent of the total cost of operation, while on the electric lines maintenance of electrical equipment of cars represents 4.332 per cent of the cost of operation. These items are not comparable and are presented only for the purpose of giving a very general indication of the comparative cost of maintaining electric and steam equipment.

RELIABILITY OF SERVICE

The records of a large elevated railway show only one-third as many delays to service owing to failure of equipment since electricity was adopted as there were when operating with steam. These records refer to actual number of delays and do not take into consideration an increase of more than 20 per cent in the number of trains operated. Some of the officials of this road state that this is the most important benefit which that company has derived from the adoption of electricity. This reliability of service is of even more importance to steam railroads than to the elevated, where suburban service is operated on the same tracks as through trunk line trains, as any delay to the suburban service is not only a cause of annoyance and expense in itself, but is also the cause of annoyance and expense in connection with the through service.

It has been said as an argument against electric equipment that a failure at the power house will tie up the entire service, while if a locomotive fails it does not have any effect on other locomotives operating on other sections of the line. This is true, but the above record is conclusive evidence of the fact that a central power house gives a more reliable service than can be obtained by the use of steam locomotives. In considering this feature of the question it should be borne in mind that the conditions under which steam locomotives were operated on the elevated railways were unusually favorable, and the punishment to which they were subjected was not as great as that which locomotives receive in a heavy suburban service on surface lines.

One of the causes for this reduction in the number of failures of equipment is undoubtedly owing to the even distribution of draw-bar strains. With electrical equipment these are distributed throughout the train in a manner which compels each car to do its share of the work, and it is only reasonable to expect that with such a distribution there will be fewer failures.

COAL CONSUMPTION

L. B. Stillwell, in a discussion before the International Engineering Congress at the World's Fair in St. Louis, made the following statement:

"The saving in coal with a central station electric power plant over steam locomotives is greater than is often assumed. The plant of the Manhattan Elevated delivers power to the switchboard at the rate of 2.6 lbs. of coal per kw-hour under conditions of full load, and the power is delivered to the motors through the third rail with about 60 per cent efficiency, giving a consumption of 4.3 lbs. per kilowatt, or 3 lbs. per horse-power at the draw-bar. A road with heavy traffic and a large and efficient central power station should use only about half as much coal as when using steam locomotives, and this may even be reduced under favorable conditions to one-third."

The cost of electric power per kw-hour is well established by records from large numbers of power stations which have been in operation for many years. This figure, of course, varies with the price of coal. On a basis of coal at $2.75 to $3 per ton, .0050 per kw-hour at the switchboard is a very fair figure, but tests have been made which were as low as $.0036. All records which have been made show very clearly that with a heavy traffic the cost of coal is very much less with electric than with steam equipment.

This is a very important item in the question of the cost of operation, but is insignificant in comparison with the large question of furnishing a railroad service which will meet demands and develop the earning capacity of a road to its fullest extent.

LIGHTING AND HEATING

The cost of lighting cars by electricity on the elevated railways is only about 12 per cent of the cost of doing this work under the systems which were in use before the introduction of electricity. This is, however, one of the smallest features for consideration, as there is no other one thing which adds more to the attractiveness of any service than well-lighted cars. The fact that this is recognized by railway officials is borne out by the large expenditures which are being made for the purpose of equipping cars with electric light, as this is recognized to be the ideal light for all purposes. Where cars are propelled by electricity it is a matter of very small expense to introduce a complete system of electric lights; the cost of power for furnishing them and the cost of their maintenance are insignificant.

The ideal method of heating cars, from an operating standpoint, is by electricity, but the cost of fuel with this system is much higher than by the use of steam. The existing systems can be used for heating at terminals and electric heaters used where the cars are in service. Under either this plan, or electric heaters alone, the cost is a very small item in relation to the total cost of operation.

SYSTEMS OF ELECTRIC TRACTION

Two systems of electric traction are in use in this country. They are designated as the direct-current or d. c. system, and the alternating-current or a. c. system.

The d. c. system cannot meet all the demands of heavy trunk line railway service. It should not therefore be installed on suburban lines, as any system introduced for this service should be one which can be extended to meet the requirements of all classes of service. It would be just about as reasonable to undertake to operate all of our steam locomotives with a uniform boiler pressure of 50 lbs. per square inch as to undertake to operate a heavy freight service with an electric current of 600 volts. If our through passenger and freight service is ever handled by electricity, it will be at much higher voltages than those which can be obtained with the d. c. system. This system, in addition to placing a limit on the voltage, requires the use of a third-rail conductor for heavy service. This type of conductor has its place. It is giving excellent satisfaction on elevated railways, and on some lines conditions exist which will not permit of the use of any other type. Where conditions will permit of the use of either the third rail or an overhead conductor, due consideration should be given to the following objections which have been brought to the third rail:

(a) It cannot be used in terminals or yards where switching is done, and therefore this work must be performed by steam locomotives, or an overhead conductor installed, which involves two systems of collectors.

(b) Liability of fire in case of wrecks. A number of fires have resulted from cars coming in contact with the third rail and causing a short-circuit to the track rail.

(c) Danger to track walkers, section gangs, train men and trespassers. A large number of such persons have been maimed or killed by coming in contact with third-rail conductors.

(d) The rail must be broken at grade crossings and the power cut off the trains at such points, or an overhead conductor installed.

(e) The liability of the third rail to become displaced by a derailment.

(f) The necessity of accurate adjustment in height. A variation in the height of the rail may interfere with the service.

(g) Difficulty of keeping it free from snow and ice. With a protected rail a heavy sleet storm will fill the space above the rail solid with ice and tie up the road.

(h) Danger to section gangs employed in tamping ties and renewing rails. It would be practically impossible to renew a long section of track rail under the system commonly employed without cutting the current out of the third rail.

(i) Difficulty regarding clearances. Where the third rail has been installed there has been trouble in fixing a location in which it would clear locomotive cylinders, trucks of cars and other parts of the rolling stock. Also in clearing station platforms and building along the right of way.

(j) The cost of installation is subject to small variation and must be almost as great for light traffic and easy conditions as for heavy traffic and severe conditions.

Each one of these objections should be given consideration only as it relates to a particular installation which is being considered. There are places where the advantages to be gained by its use will more than offset all of these objections, and it is the best form of conductor to use.

With the single-phase a. c. system, the overhead conductor is used. It has objectionable features, some of which are as follows:

(1) Difficulty of securing head room through tunnels, under bridges and existing structures. These have been so serious as to compel the use of a third rail at some places.

(2) Snow and ice will collect on the trolley wire.

(3) Poles and guy wires break and allow the trolley wire to fall.

(4) Trolley wire break.

Both of these lists could be increased and others given setting forth the advantages of both types, but such a procedure would prove nothing. The strongest argument which can be brought to bear on this large subject is in favor of the overhead conductor, viz.: It is in successful operation on thousands of miles of railway. The structure for supporting this type of conductor can be varied to suit conditions.

DISCUSSION

A discussion which followed the reading of the paper on electricity on steam railroads by Clement F. Street at the Western Railroad Club, May 16, 1905, was mainly participated in by electric railway engineers, who had been especially invited to attend the meeting. The steam railroad men who compose this organization did not take much part.

Prof. Goss, of Purdue University, referred to the author's statement that with electric traction it was possible to deliver 1 hp-hour at the car axle for 3 lbs. of coal. He presumed this figure represented the most favorable performance of electric traction that could be expected. In this connection it is interesting to note that tests which he had looked over, and which would be published in time, showed that the modern simple steam locomotive, under favorable conditions on the road, would at all times deliver a hp-hour at the axle for less than 4 lbs. of coal. A modern compound locomotive would deliver a hp-hour at the axle for less than 3 lbs. of coal, and sometimes as low as 2.2 lbs. The coal in both cases would be of good quality. While this was only one of the points to be considered in a discussion of this kind, the comparison was interesting.

George A. Damon, when called upon by the chairman, referred briefly to a number of computations on the electrical equipment of steam roads which the Arnold Company had made. He also briefly reviewed the progress in electric railway engineering and told what the electric engineer has to offer to the steam railroad man to-day. One of the reports referred to was on the electrical equipment of 180 miles of a Western railroad which it was proposed to supply from a water-power plant. In this case the electrical equipment would have cost $15,000 per mile, and the possibility of making the increased earnings resulting from the change pay the interest of the investment was doubtful. Recently his company had figured on the electrical equipment of 100 miles of steam road in Canada. With the improvements in the art, due to the introduction of single-phase motors, they were now able to figure that the cost on this Canadian road would be $10,000 per mile for electrical equipment, which showed that electrical engineers were getting nearer to a solution of the question. In figuring on such an electrical equipment, a curve was plotted, showing the interest on investment, plus operating expenses per ton-mile with various total ton-mileages. This was done both for steam and electric operation. With electrical equipment, the curve of cost per ton-mile started at a high point and declined very rapidly because of the large investment per ton-mile carried when the ton-mileage was small. The curve for steam haulage is much nearer straight. At the point where steam and electric curves crossed, it would pay to begin the electrification of the road. He also referred to the electrical equipment of the Grand Trunk Railway tunnel between Port Huron and Sarnia, under the St. Clair River. In this case, one of the first objects was to do away with the gases from the steam locomotive, which had proved fatal in several cases. Incidentally, the company would gain other advantages, one of which was that the capacity of the tunnel would be increased from three trains per hour to four trains. There would also be a better load factor on the locomotives in operation, as pushing locomotives were obliged to lie idle a large amount of time each day. In connection with this plant, they were figuring on thermal storage in the boiler room, so as to provide the steam for periods of heavy load when trains are going through the tunnel.

Fred L. Lucas, manager of the Bloomington, Pontiac & Joliet Electric Railway, was then called upon and reported a very satisfactory experience with the General Electric single-phase railway motor in operation on his road. One car was in operation which had run about 9000 miles. He was pleased to report that there was no trouble whatever with the commutation. The car consumption, as closely as they could arrive at it, was about 2 kw-hours per car-mile, which, with this equipment, was about 53 watts per ton-mile. Some had objected to the single-phase motor because of its slow acceleration. He found that passengers on his road remarked favorably on this point, and commented on the absence of jerking in starting, which occurs on many direct-current roads.

H. M. Brinckerhoff illustrated the advance in heavy electric railroad work, by speaking of the time when on the Intramural

Railway at the World's Columbian Exposition. He said that he and other employees of the road would station themselves at certain points to the leeward of the track on days of heavy traffic and judge by the sense of smell whether any given motor car was able to make another round trip without burning out. Heavy electric railroad work had got beyond that stage long ago. One point he wished to bring out in connection with suburban service was that in these days people follow transportation facilities instead of transportation facilities following the people, as in former years. The steam road that would put on frequent electric service would find suburban traffic coming its way. About ten years ago the Garfield Park line of the Metropolitan Elevated ran for long distances through territory where there was scarcely a house within two blocks of the line. To-day this was the best line his company had. He asked why it was not possible for steam railroads to inaugurate electric service on their present rights of way and so prevent the building of parallel interurban lines. If a parallel interurban line could be made to pay, why could not such electric service on the steam road right of way?

J. R. Cravath, being called upon, spoke especially on the limitations of the locomotive in maintaining a fast schedule during the rush hours. He believed that the multiple-unit system with electric motors under a large number of cars on a train was the only solution for present loss of time during the rush-hour period. The locomotive at such times finds itself loaded heaviest of any period of the day, when, in order to make up for other delays, it should really be loaded the lightest.

CORRESPONDENCE

RELATIONS WITH THE DAILY PRESS

GALVESTON CITY RAILWAY COMPANY

Galveston, Tex., May 17, 1905.

EDITORS STREET RAILWAY JOURNAL:

Replying to your request for a further discussion on the relations between a railway company and the daily press, the writer's opinion on the subject of free passes and the reasons for his opposition to them were published in the Question Box in your issue of Feb. 25. While disguised and euphemised as a "courtesy," the giving of free transportation by a railway company to anyone in a public capacity from whom it expects the slightest favor or influence is nothing but a petty bribe, and no amount of casuistry can make anything else of it, and the consequences of bribery will always follow in a greater or less degree.

The free transportation equitably abolished, the railway company is on a business plane with every other advertiser, and, as regards advertising, it should conduct itself and its business with the paper as such. For any public mention that adds or will add to its convenience, receipts or value, or that lessens its expenses or risks, it should be willing to pay, and should pay, the same as any similar advertiser. Further, in case its conditions or facilities are such that it thinks it needs no advertising or that it can do its own advertising itself in its cars, parks or publications, it should forego some of these and patronize the advertising columns of the papers to an extent as least commensurate with the traffic patronage it receives from them. The newspapers, especially "local" ones in the small cities and towns, depend upon their "news" for their circulation and on their "ads." for their profit, and the local railway company can—and should—aid the papers in both items.

Local news, especially in the smaller cities and towns, is always welcome to the average newspaper of such localities, and if the railway company will furnish from its property or happenings "news"—without trying to run in an "ad." in disguise—it will generally find a willing and grateful recipient in the press of the locality. In doing all this there are, however, several things to do and to remember; first, "square yourself" with the paper or papers, make a friendly call on the proprietor, manager or editor at a preappointed time, and make that time at their convenience. Come down to business at once, explain the policy of your company, its aims and intentions as far as you are free to do so, learn how the paper is disposed toward your company, correct any misapprehensions and don't be drawn into an argument. Have an understanding as to what is to be allowed as "news" and what is to be charged for as advertisements, and settle on a—to the paper—liberal rate for the latter.

Then assure the editor and show him that you will voluntarily, promptly and truthfully give him everything important in the way of news in regard to your company that you can give without violating the confidence or contravening the policy of the owners or injuring the prospect or value of the company. Assure him that the inquiries by himself or other of the paper's representatives in regard to company matters will always receive courteous attention. In return for this, ask that no communication or article of news adversely affecting the interest of the company be published without notifying you in regard to it, obtaining your opinion as to the necessity of its publication and giving you an opportunity to correct it or reply to it. Ask also that no communication from, conversation or expression of opinion of any sub-employee of the company in regard to company matters or things affecting it be ever published without being submitted to you for your approval and consent to its publication. Ask also that any interview with you or remarks or conversation attributed to you be submitted to you for correction, as written for publication and before it is published. Ask that all cases of "hearsay and they say" be verified through you as managerial head. Ask these as favors, and in ninety-nine cases out of a hundred your request will be granted.

If there is more than one paper locally, pursue this policy with all, with the additional understanding with each that all are to be treated with strict impartiality as to both advertisements and news, others things—such as locality of circulation, day or hour of issue—being equal. This is important—give no "scoops" on your company's business or doings; it makes press partisans and press enemies, and you do not desire the one, nor can you afford the other, except on a matter of grave principle.

Now keep to your part of the agreement, give them all the "news" you possibly can, and give it to them freely, fully and correctly; if you cannot do so, in regard to any special matter, tell them so and, if possible, your reason for your inability to do so. If necessary, tell them what they desire to know, but state specifically that it is not for publication. Very few papers will violate a confidence thus given or will feel hurt at one withheld for good or prudent business reasons. It is second nature in an editor or reporter to scent news and run it down to publication if it is withheld without a good reason, but an explanation of the reason and a request for non-publication will, in almost all cases, be sufficient, unless there are cogent public reasons why it must be published.

Never run amuck the editorial rooms if, by any chance, something does slip into publication that ought not to; cub reporters, overworked editors, the "devil" or a sudden paramount necessity may have been the cause. Even editors and reporters are human and err in judgment or execution. Your company is seldom the "whole thing" in your locality, and it may have, at the last moment, seemed necessary to the welfare of the paper or of the community to publish the offending item. Try—amiably and quietly—to have the powers-that-be see to it that the occurrence is not repeated; if it has done you a wrong or an injustice ask—also amiably and quietly—that it be corrected, and you will generally find that they are perfectly willing to do so and will stick the correction in an obscure portion of the paper where no one will notice it; that is human nature.

Be nice to the newspaper men. If you meet them on the street don't always be too busy to greet them, to tell them something that will interest them or to chat with them on subjects of general interest. If they call at your office don't pretend to be too busy to see them; if you are really busy on an important matter inform them so courteously and regretfully and make an early appointment, and keep it. If you do see them don't act as if you were proud or bored; open up the box of cigars you keep in a locked drawer on your desk, open the lid wide to them, push back your chair and chat.

Do not show that you feel aggrieved if the papers do not publish everything you give them as news or do not publish it exactly as you gave it or wrote it; they are generally the best judges of what constitutes news to their readers, and if they give the facts as you gave them, they have the right to put them in the form best suited to their idea of publication. If you desire a communication published strictly "verbatim et literatum," say so, and if it is refused in that form the advertising columns are always open to you at either regular or display rates, provided you don't want to cuss, quarrel or be indecent. In "news" the paper must be the judge; the affairs of your company should be of paramount importance to you, but you must not figure that they are the same to everyone else. Never rush or be led into a dispute with a paper in its own columns; settle such disputes personally and amicably in the office; there you have a chance for the last word; in the columns of the paper you have less than if you were arguing with a woman.

Never—if it can be in any way avoided—reply to one local paper in the columns of another; allow each one to correct its own errors; you'd much rather be treated that way yourself. If, however, different dates or times of publication between the papers necessitates such a course, so inform the one to whom or to whose article or item you wish to reply; that is only a business courtesy.

Also, if there is any real "courtesy" that you can offer the papers or their representatives, do not neglect it. If your "owners" or any important men come on a visit; if you give a dance or dinner or outing to your employees; if you open up your road or an extension of it or a new power station or car house or park, in any "blow-out" appertaining to the company, see that the press has a cordial invitation, a prominent position and a good time. It is a courtesy due them; it is always appreciated; it results in good feeling and, sometimes, in a write-up that you could have got in no other way.

Finally, never refuse information in regard to your company that is legally and plainly due the public or for publication, or that can be obtained from other sources or in other ways.

Of course, there are newspapers and newspapers, just as there are railways and railways. As long as human nature is fallible and venal, so long will some newspapers, and some railways, be the same. You will find venal editors, managers and proprietors of papers, but you will not find many more than in any other business—not as many in fact, especially in the smaller cities and towns. A "local" paper is too open and public a proposition to remain crooked for long without the public finding out that fact, and when the public does "catch on" the influence of the paper is gone, for the people will evidence that fact by laughing at its demonstrations. If your cause is just and your intentions and acts truthful and honest, you need not long fear the "roasting" of any paper, especially if it is directed by spite or as a "strike." Where any paper attempts such a course, straighten it personally and straightly if you can; if not, and you have good and sufficient grounds for a reply, write it out carefully and ask for its insertion as a communication; if this is refused and the matter is of sufficient importance to warrant it, put it in the advertising columns in a display location and pay full rates for it. As a last resort, if there is a rival paper, get into its columns and "carry the war into Egypt."

All the above, if your acts, intentions and policy are honest, will bear full public inspection. If they are otherwise and you yourself are trying a hold-up or strike, keep away from the newspapers. You may bribe or scare or buy a newspaper into backing you up for a time in such proceeding, but it cannot last long. Few papers of any respectability or influence can afford such a course, for the public is not by any means such a fool as it seems sometimes to be; it will "catch on" sooner or later, and then "the last state of that paper and that company shall be worse than the first."

Just remember that a newspaper is a business organization for legitimate profit; that the ordinary business rules of honesty and courtesy apply to it equally as to your own company; that its proprietors and employees are merely the average human being as to personal attributes, but a little above the average as regards education and experience in people and human nature; treat them accordingly; be candid and ingenuous with them and you will have no better friends and auxiliaries if your course is a straight one.

H. S. Cooper, General Manager.

ECONOMY OF STEAM AND ELECTRIC LOCOMOTIVES

Brooklyn, May 17, 1905.

Editors Street Railway Journal:

In a notable article contributed to your issue of May 6 by A. H. Armstrong, the low economy of the steam locomotive is strikingly indicated. Mr. Armstrong cites the case of a typical steam locomotive designed for heavy freight haulage which, when working at its maximum rate, would develop 1400 hp by the use of 40,000 lbs. of steam evaporated per hour by the combustion of 8000 lbs of coal, worth $4 per ton. This makes the coal consumption equal 5.7 lbs. per ihp-hour, and is equivalent to 7.65 lbs. of coal per kw-hour developed in the engine cylinders using kw-hour as a unit of energy, as convenient for mechanical as for electrical work. Contrasted with this, Mr. Stillwell, before the International Engineering Congress, gave figures showing the economy of transmission from the alternators in the Manhattan station to the third rail to be 85 per cent. He also stated the coal economy of that station to be 2.6 lbs. of coal per kw-hour at the switchboard, the coal being worth $3.50 per ton. I think few engineers will question the statement that the efficiency between the draw-bar of the combination of tender and steam locomotive and the cylinders of the locomotive is no higher than the efficiency between the mechanical energy available at the draw-bar of an electric locomotive and the electrical energy supplied from the third rail, in such work where the energy used in acceleration is small in comparison with that used in haulage at normal speeds. The ordinary mechanical efficiency of steam engines of the type used for the propulsion of steam locomotives is not over 92 per cent, which fact, when coupled with the considerable losses due to the great vibration characteristic of a locomotive working at fairly high speed, will substantiate the statement I have made. On this basis the electric locomotive would use 3.06 lbs. of coal per kw-hour supplied from the third rail, and the steam locomotive would use 7.65 lbs. of coal per kw-hour developed in the locomotive cylinders. The former value is just 40 per cent of the latter. The difference in cost of the coals used by the two systems makes the cost of coal per kw-hour for the electric locomotive equal 0.48 cent per kw-hour delivered from the third rail, and the cost of coal for the steam locomotive equal 1.37 cents per kw-hour developed in the locomotive cylinders. The former value is 35 per cent of the latter.

Hartley LeHuray Smith.

LIGHT ELECTRIC RAILWAYS

The possibilities of narrow gage electric railways for rural communities were discussed by J. R. Cravath at a meeting of the Chicago branch of the American Institute of Electrical Eneers, May 23. Mr. Cravath stated that in many parts of the country, particularly in the States west of Indiana, there was opportunity for the construction of a cheap interurban electric railway where the standard form of construction could not be made a financial success. In other words, there are scores of places that would not yield an interurban road a gross revenue of $3,000 per track-mile, and there is little prospect that they ever will; yet half or two-thirds that income would be certain and continuous.

The first thing to be done in planning such a road is to dismiss the idea of using cars of the weight and operated at the speed required in interurban service, and this naturally suggests narrow gage. Narrow gage railways have fallen into disrepute among railway engineers, Mr. Cravath believes, principally because they do not differ sufficiently in cost from standard gage roads to make the saving in first cost worth while in most cases. For this reason the writer recommends a 28-in. gage. On such a road maximum speeds of from 15 m.p.h. to 20 m.p.h. could be made with light double-truck cars of from 8 tons to 10 tons weight. Such cars would be equipped with from 30-in. to 33-in. wheels, and the car floor would be made higher at the ends over the motor trucks than in the middle, so as to accommodate the motors. If a motor truck were placed only under one end of the car the trail truck could have small wheels and be arranged in the common manner. By the arrangement suggested, the center of gravity will be low, and a compartment is left at one or both ends of the car above the motor trucks, in which can be installed the various electrical appliances that are usually under the car, but which cannot be so placed when the car body is hung as low as it is in this case. These compartments can also be occupied by the motorman and used for baggage. The car body can be supported by I-beams or channels in the sides of the car just below the windows, and these beams can also support the side sills of the passenger compartment by means of tie-rods and struts. The length of the car may vary considerably, but for very light traffic a car 18 ft. long is suggested. This will seat comfortably twelve passengers. Equipped with a motor-truck at one end only, it will probably weigh not more than 10 tons, and with a motor truck on both ends, 12 tons.

It is assumed that single-phase motors are to be used, which would cause the electrical equipment to weigh more than a direct-current equipment. No such narrow-gage, single-phase motors have been produced yet, as far as the writer knows, but undoubtedly could be produced were there need for them. Motor cars, such as suggested, could haul one or two light freight cars on roads without heavy grades. For a road of this kind trailers would probably best serve to carry freight, and they should be designed so as to allow the freight to be readily transferred to grain elevators or steam road freight cars. Standard T-rails of about 30 lbs. per yard could be used.

The cost of grading could be reduced, first, on account of the narrower cross section of the cuts and fills, and second, because on this style of road it would be good engineering to avoid cuts and fills and pick a location which would go around hills instead of through them.

The following estimates are on the cost per mile of a railway built according to the foregoing ideas:

TRACK AND GRADING

Right of way donated.	
Grading averaging 7000 cu. yds. per mile, at 18 cents per cubic yard	$1,260
30-lb. T-rail, at $33 per ton, 52.8 tons, 30-ft. lengths	1,742
176 rail-joints, at 75 cents each	132
2640 ties, 4 ins. x 6 ins. x 4 ins., at 20 cents each	528
30 kegs spikes, at $3	90
360 bonds, at 30 cents each, in place	108
Labor, laying track	300
Highway crossings	25
Fencing (20 miles)	150
Track total	$4,335

GENERAL ROADWAY ITEMS FOR 15-MILE ROAD

Culverts, etc.	$1,500
Bridges	1,000
Special work	2,000
	$4,500
Per mile	300

OVERHEAD LINE PER MILE

48 poles (25-ft.), at $4	$192
Wood brackets (cross-arm size) 3.5 ins. x 4.5 ins. x 60 ins., at 50 cents.	24
48 high-pressure insulators, at 15 cents	8
5280 ft. No. 0 trolley wire, at 15 cents per lb	253
5280 ft. 0.25-in. steel-stranded catenary, at 0.65 cents per foot	34
528 clips and catenary attachments, at 20 cents	106
Miscellaneous overhead supplies	50
Labor on trolley and catenary	150
48 cross-arm tie-supports, at 15 cents	7
Telephone wire, 2 miles, No. 8	30
Telephone insulators and brackets	10
Labor on telephone line	25
	$889

ROLLING STOCK, BUILDINGS, ETC., FOR 15-MILE LINE

3 passenger motor cars, at $2,500	$7,500
2 passenger trailers, at $750	1,500
1 freight motor car	2,200
15 miscellaneous freight cars, at $300	4,500
Car house and repair shop	2,000
100-kw generator capacity in lighting station	2,000
Miscellaneous engineering and superintendence	15,000
Total for 15 miles	$34,700
Per track-mile	2,313

RECAPITULATION, COST PER TRACK-MILE

Track and roadbed	$4,335
General roadway items	300
Overhead work	889
Rolling stock, buildings and miscellaneous	2,313
Total per mile of track	$7,837

The operating expenses are estimated as follows:

Power per train-mile, 1 kw-hour, at 3 cents (purchased)	$0.03
Motormen's wages	0.025
Repairs and maintenance on rolling stock	0.005
Repairs and maintenance on track and overhead line	0.01
General expenses	0.015
	$0.085
135,000 train-miles per year, at $0.085	$11,475
Cost of operation per track-mile ($11,475 ÷ 15 miles)	765
Interest at 6 per cent on $7,900 per mile cost construction	474
Interest and operating expenses per track-mile	$1,239

The writer then estimates the receipts, and figures the purely agricultural freight business per square mile and per annum, as follows:

94 tons live stock, at 50 cents a ton	$47
8.1 tons coal, at 50 cents a ton	4
3000 bushels of grain, at 1 cent a bushel	30
Total freight revenue per square mile	$81

A line 15 miles long could be considered to have a tributary area of 106 sq. miles, which would give a freight revenue of, say, $70 per sq. mile, or $494 per track-mile.

The rural passenger traffic could be taken as $10 per capita per year, and population as 10 per sq. mile. Assuming one village of 1000 inhabitants on the line of the road, the average revenue therefrom should be about $5 per capita per annum. This would give as gross receipts per mile of track:

Passenger earnings (rural)	$706
Village passenger earnings	333
Freight earnings, lowest estimate	494
Mail and light express	100
Total gross earnings	$1,633
Operating expenses	765
Net	$868
Interest on investment	474
Surplus	$394

THE QUESTION BOX

The Question Box as conducted in the STREET RAILWAY JOURNAL for the past three months has proven so popular that it has been decided to extend this department by the publication of additional questions. These are printed below, together with two or three questions in the original list, for which additional replies have been requested by a number of subscribers. The readers of this paper are urgently invited and requested to send in answers to as many of the queries as possible. Most of the following queries have been received from correspondents since this department was started:

A.—GENERAL

Claims

A 13a.—How can the claim department best co-operate with the operating department in the prevention of accidents?

A 13b.—Have you ever used the camera to good advantage in adjusting damage claims? Please give details.

Trailers

A 17.—At one time the use of trail cars was quite general on electric railways throughout the country. Then came a period when the running of trailers was looked upon with more or less disfavor. There seems to be a decided tendency at the present time to go back to trailers. Please give your ideas and experience relative to trailers. Under what conditions do trail cars properly find a place in the operation of a modern electric railway? Do trail cars cause a greater number of accidents? If they do, what can be done to make them safer? What is the economy in running trailers?

A 17a.—If trail cars are used, should cars be equipped with some form of multiple-unit control? If so, would you favor putting four motors on the first car and none on the second, or two motors on each car, or four motors on each car? What are the factors entering into the question?

Schedules

A 35a.—Can a fifteen-minute service be given successfully upon a single-track interurban road? If so, under what conditions?

Fares

A 36a.—Based upon experience, what is a proper rate per mile for interurban passenger business, and to what extent should these rates be reduced by the sale of commutation tickets, monthly tickets, coupon books, etc.?

A 36b.—How do you handle your half-fares?

A 37.—What is the best method of collecting and checking fares on interurban roads?

Manager's Records

A 47.—Have you worked out any special form of hand book or note book by which the manager can keep in convenient shape for quick reference the various data and statistics relative to his property, such as comparative receipts, car mileage, station output, etc.? How do you keep this information? Sample pages or sheets from your book, with description, will be appreciated.

Sprinkling Streets

A 48.—Information is requested regarding the sprinkling of streets by street railway companies, and particularly the proportion of street usually sprinkled, and the amount paid by the city and municipalities for this service. Does your company sprinkle streets? If so, on what terms?

Despatching

A 49.—Information is requested relative to good despatching systems on interurban roads.

(a) What is the proper method of numbering trains?

(b) What is the best method of keeping records of orders given in order to insure accuracy?

(c) What special precautions do you take to insure that employees understand the orders and carry them out properly?

(d) Please describe a simple board for despatcher's use, showing location of all trains at all times.

Destroying Tickets

A 51.—What is the best method of destroying tickets and transfers? If a machine is used for this purpose, what is its maintenance expense, and what would be the power required for a machine capable of handling, say, 300,000 tickets and transfers per day and macerating unused transfer pads containing 100 transfers bound with wire staples?

Automobiles

A 52.—Is your company using any form of automobile wagons for cheapening or expediting the work of any of the departments? If so, please give description of wagon and statement as to the results secured.

B.—EMPLOYEES

B 17.—Have you any system of special rewards or prizes to conductors and motormen for meritorious service? Please give complete details of the system and the results secured.

B 17a.—What arrangements have you whereby employees can secure life insurance or pensions? Please give details and the results secured.

B 27.—What do you consider the best system for keeping records of individual conductors and motormen? Please describe the system you use.

B 30.—What has been your experience with the Brown merit system?

E.—MASTER MECHANIC'S DEPARTMENT

Fireproofing Cars

E 11.—What can the master mechanic of the average surface road do to render his cars more nearly fireproof?

Bearing Lubrication

E 46a.—State experience with use of oil instead of grease for lubricating armature and motor bearings.

E 47.—Give description, with sketch of journal box, suitable for using oil for motor lubrication.

E 48.—How can the ordinary journal box designed for use with grease be changed to use with oil as a lubricant?

Wheels

E 55.—The question of cast-iron versus steel wheel is receiving considerable attention. Please give your ideas and experience with respect to the following:

(a) Life and cost (per 1000 wheel-miles) of cast-iron wheels.

(b) Life and cost (per 1000 wheel-miles) of steel-tired wheels.

(c) Life and cost (per 1000 wheel-miles) of rolled-steel wheels.

(d) What are the determining factors in deciding the wheel problem, and under what conditions will the steel wheel supplant cast iron?

Brake Shoes

E 66a.—What has been your experience with different types of brake-shoes?

E 66b.—What effect has the type of shoe on the life of the wheel?

E 66c.—How thin is it safe to wear a shoe?

E 66d.—What is the cost of your shoes per 1000 car-miles?

E 66e.—Have you had any trouble with shoes breaking?

E 66f.—What adjustment do you allow between the shoe and the wheel, (1) With air brakes? (2) With hand brakes?

Shop Devices

E 156a.—There is always a demand for information relative to labor-saving devices and schemes for the shops. If you are using any novel device or labor-saving scheme not recently described in the STREET RAILWAY JOURNAL, please send description and photographs or drawings. Progress is made by a mutual exchange of ideas and suggestions.

Car Houses and Shops

E 184.—Suggestions are requested as to the best layout for car houses and shops. What do you consider the "ideal" arrangement for car house and shops? Please give your ideas, suggestions, sketches, etc.

E 184a.—What are the relative merits of slow-burning mill construction and other available types of construction for car houses?

E 184b.—What is the best form of roof for car houses?

E 184c.—What is the best layout for entrance tracks to car houses?

E 184d.—What is the best material for car house floors? How should floors be laid?

E 184e.—What is the best form of pit for car houses?

E 184f.—What are good ways of lighting pits?

E 184g.—What are good ways of heating pits?

E 184h.—What form of hoist or jack do you use for lifting car bodies? If the hoist was made from your own plans, please give details and drawings.

E 184i.—For the average repair shop, what is the best method of driving the tools?

E 184j.—What specific acts or precautions instituted by your company have resulted in reducing fire risks at your car houses and shops?

F.—STEAM ENGINEERING

Measuring Feed-Water

F 20.—What is a cheap and simple method of determining amount of feed-water used in boilers at a small or medium-size plant?

Treating Feed-Water

F 28.—How can the engineer of a small power station, without consulting a chemist, determine the scale-forming ingredients of the feed-water he is using, with a view of injecting neutralizing chemicals?

F 29.—Is it practicable to use soda ash for purifying boiler feed-water? What are the objections? Under what conditions should soda ash be used, and in what quantities?

F 30.—Under what conditions can kerosene be used to advantage in boilers? What are the objections to the use of kerosene?

F 31.—Will zinc placed in a steam boiler prevent scale or corrosion? Under what conditions of feed-water impurity should zinc be used?

Leaks

F 38.—How do you test vacuum enclosing pipes and vessels for leakage?

Condensing Water

F 40.—What is the best method of guarding against possible shortage of condensing water supply?

Fuel

F 47.—What is a quick and sufficiently accurate method of determining the comparative values of different grades and kinds of coal for boiler firing purposes?

F 48.—In a small or medium-size station, what is the best method of determining amount of coal consumed? Give details.

F 50.—An engineer of a small power station requests suggestions on reducing cost of handling coal from cars to boilers. He does not believe size of plant warrants chain bucket conveyors. Can you give him any pointers or "wrinkles" on reducing this cost?

F 51.—On your road, what is the cost of boiler room labor per ton of coal fired, including handling ashes? (State whether hand firing or automatic stoking is used.)

Bonus to Firemen

F 54a.—What schemes are there for encouraging boiler room employees to take greater interest in their work? Please give details and results secured.

Coking Arch

F 57.—Can the efficiency of an ordinary hand-fired boiler be increased by the use of a fire-brick coking arch over the grates? Give results of experience.

F 58.—Have you ever used a fire-brick wall at the back of the furnace? Into what form did you build the brick and what were the results secured? Please send sketches.

Compressed Air

F 59.—For what uses, if any, do you employ compressed air in the boiler room? What has been your experience with the air lift for raising water from wells?

Flue Gases

F 60.—What is a cheap and simple method of testing flue gases in a small or medium-size plant?

Carrying the Peak

F 65.—Have you ever tried injecting a jet of steam under boilers to raise steam pressure at times of heavy demands? Give details of arrangement and result secured.

F 66.—In a small or medium-size plant, what is the best method of increasing boiler capacity during heavy peak loads? Give details and results obtained.

Draft

F 70.—What is a simple method of determining roughly the draft of a chimney, where absolute accuracy is not required?

G.—THE ENGINE ROOM

Generating Units

G 2.—What are your ideas, based on experience, regarding the use of several small generating units in place of one or two large units? Give details, cost and results secured.

Lighting

G 3.—Is it possible to run a commercial lighting or power load from generating units that are supplying current for railway purposes? How can it be done? What is the best method of regulation in such case to prevent fluctuations in the lighting or power circuit?

Compressed Air

G 4.—To what various uses do you employ compressed air in the engine room?

G 5.—How do you obtain compressed air for the various uses about the power house? At what pressure do you use the air?

Lightning

G 6.—Please state in detail what trouble you have had with lightning at your power house. Then please state in full what steps you have taken to prevent damage from lightning.

Bonuses

G 7.—Do you know of any satisfactory schemes whereby all employees of a power plant can participate in a bonus when station is operated at especially good economy? Give details and results obtained.

Station Testing

G 8.—A young engineer, who has yet to win his spurs, has been given charge of the power house on a twenty-car road. He has been asked by the manager to carry out a general efficiency test of the entire station. He wants suggestions from some of the older heads as to some of the things he should and should not do in carrying out these tests. He wants to know how to dispose his available forces so as to obtain the data without taking on additional help. If your manager should ask you to make tests and report on just what each department of the power house was doing and could do, how would you go about it to get the information? This is a matter especially worthy of discussion. Suggestions are particularly requested.

H.—THE LINE DEPARTMENT

Lightning

H 1.—Please state in detail what trouble you have had with lightning on any part of the transmission or distribution system. Then, please state in full, what steps you have taken to prevent damage from lightning.

Safeguards

H 3.—What is the most efficient method of protecting high-tension lines from contact with trees?

H 4.—What is the best form of cradle or other device for catching broken high-tension lines at highway crossings, or where the lines cross over or under other wires?

Painting Poles

H 8.—What is the best way to paint trolley poles? Give sketch or photograph and description of apparatus used; also detailed cost of doing the work.

Raising Poles

H 9.—What is the best way to raise and set trolley poles? Give sketch or photographs and description of method; also detailed cost of doing the work.

Overhead Work

H 12a.—What is the best method for attaching span wires to iron and wooden poles?

H 12b.—What is the best form of bracket suspension?

H 12c.—What is your practice in guying?

H 12.—What is the most efficient method of tapping trolley wire to feeders?

Wrinkles

H 21a.—What means, machines, devices or special rigged cars are you using for expediting or cheapening the work of the line department? Please send descriptions, with photographs or drawings, and statement of results secured.

I.—THE TRACK DEPARTMENT

T-rails in Paved Streets

I 4a.—Have you any T-rails in paved streets? If so, what has been the experience with this track? Has it proved to be a serious obstacle to vehicle travel?

Wrinkles

I 9a.—What means or devices are you using for expediting or cheapening the work of the track department? Please send description, with photographs or drawings, and statement of results secured.

Concrete Foundations

I 22.—What has been the experience with concrete foundations under rails or roadbed? Please give details as to how concrete was laid, cost of construction and results secured.

I 22a.—Where concrete foundations have been used under track rails, has there been any disintegration of the concrete and subsequent development of defects in the concrete covering, such as asphalt? If so, how was the trouble remedied?

Bonding

I 28.—What is a good method of testing rail-bonds?

I 29.—What is the best method of keeping records of individual rail-bond tests?

I 30.—What has been the experience with soldered bonds?

I 31.—In using bond tester on special work in which each joint is bonded in addition to long bonding, what is the method of procedure in case the tie-rods span two or more joints?

I 32.—What is the best form of portable rheostat to use in connection with bond-testing instrument?

I 33.—Has the conductivity of the zinc joint held up?

Switches

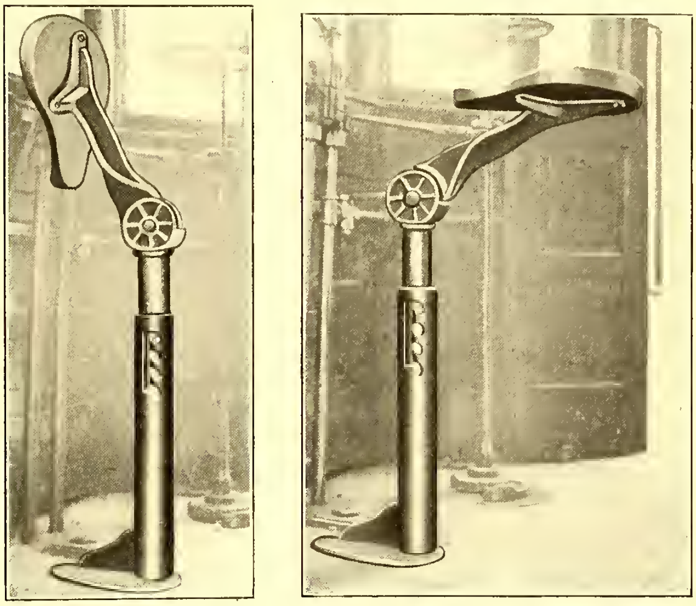
I 34.—What is the best method of preventing switches from "kicking"?

Special Work

I 35.—How many renewals of hard centers can be made on modern special work before the abutting rails are worn out?

SEAT FOR MOTORMAN

The Boston & Worcester Street Railway Company has equipped all of its interurban cars with an adjustable seat in the front vestibule for the use of the motorman when the car is running through the country districts on private right of way. As will be understood by referring to the illustrations, the seat consists of an iron pipe standard resting on a malleable-iron base plate. The seat is attached by means of a hinge joint to a pipe support which is arranged to slide up and



VERTICAL AND HORIZONTAL POSITIONS OF ADJUSTABLE SEAT

down in the standard. The seat can be adjusted to four different heights by means of a pin which engages in one of four sockets on the standard, as will be evident from the illustrations.

When the seat is not in use, the saddle, or seat proper, can be thrown forward out of the way. In its lowest position the saddle is 27½ ins. above the platform, and it can be raised to a maximum adjustment of 31½ ins. The device was made for the Boston & Worcester Street Railway Company by the Heywood Brothers & Wakefield Company, of Wakefield, Mass., which is now placing it on the market.

QUICK WORK WITH THE BROOKLYN WRECKING CAR

An interesting time record in the handling of a spare wrecking truck was recently made with the new wrecking tool car for the elevated lines of the Brooklyn Rapid Transit Company. As will be remembered from the descriptive article in the Street Railway Journal for May 13, this tool car is equipped with a spare truck for emergency work in case of a wreck, derailment or other accident, and which is carried upon a platform at one end of the car. As no crane is provided for lifting the truck down onto the rails, the truck is lowered by means of skids which are used to form an inclined runway off the end. The brake staff is removable and a block and tackle is employed both for hoisting back and for steadying in lowering. To determine the relative advantages of this method as compared with others, James R. Williams, general foreman of the Southern Division shops, where one of the tool cars is stationed, made an informal test of the time required for unloading the truck and reloading it again. The time required for lowering after getting the skids into position for the runway, was only about sixty seconds, while that for hoisting back onto the platform was about one and one-half minutes. For the latter operation, the entire wrecking gang of ten men was required.

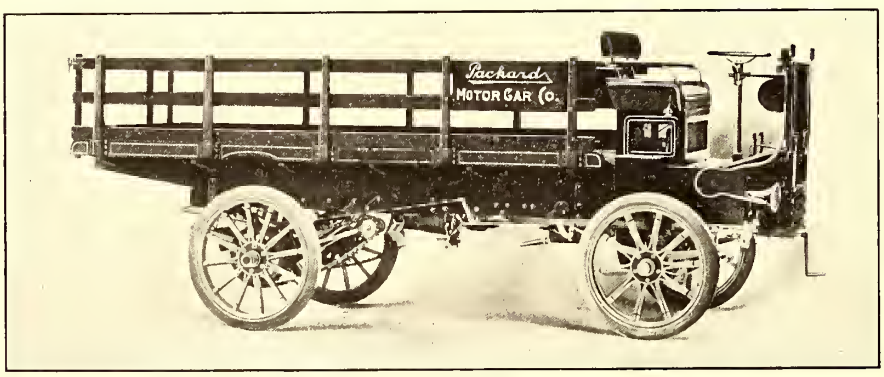
MECHANICAL ENGINEERS TO MEET IN JUNE AT SCRANTON, PA.

Arrangements have been made to hold the fifty-first meeting of the American Society of Mechanical Engineers at Scranton, Pa., from June 6 to June 9, inclusive. All sessions are to be held in the auditorium of the local Y. M. C. A. building except on the evening of June 9, when a reception will be tendered to the society in the rooms of the Scranton Bicycle Club by the local members, together with the Scranton Engineers' Club, Board of Trade and other citizens. There will also be a number of outings for the members and the ladies of the society.

Among the papers to be read are the following: Tuesday evening, June 6, "The Transfer of Heat at High Temperatures," by F. C. Wagner; "Some Types of Centrifugal Pumps," by W. O. Webber. Wednesday morning, June 7, "Microstructure and Frictional Characteristics of Bearing Metals," by Melvin Price; "Cast Iron Crushing Loads and Microstructure," by W. J. Keep; "Smoke and Its Abatement," by Charles A. Benjamin. Wednesday evening, June 7, "Can a Steam Turbine be Started in an Emergency Quicker than a Reciprocating Engine of the Same Power?" "Note on Efficiency of Steam Generating Apparatus and Performance of a Superheater," by A. Bement. Thursday morning, June 8, "Continuous Measuring and Mixing Machines," by E. N. Trump.

MOTOR TRUCK FOR THE DETROIT UNITED RAILWAY

For the conveying of railway supplies from its car houses and yards to various parts of its system, the Detroit United Railway has recently ordered a gasoline motor truck from the Packard Motor Car Company, of Detroit. This truck is not designed to run over the company's tracks, but should prove especially valuable when blockades or other accidents prevent the ordinary supply car from reaching its destination promptly. It can also be made available for use as a wrecking or repair wagon.



THE DETROIT UNITED RAILWAY'S MOTOR TRUCK FOR SUPPLIES

This truck, which has a normal capacity of 1½ tons, has a sliding gear transmission giving three forward speeds of 3 m.p.h., 8 m.p.h. and 12 m.p.h. and one reverse speed of 3 m.p.h. The speed usually averages 10 m.p.h., and as about 1 gal. of gasoline is required for every 10 miles run, the truck, when carrying the regular 8-gal. tank, can operate continuously for eight hours, covering a distance of 80 miles.

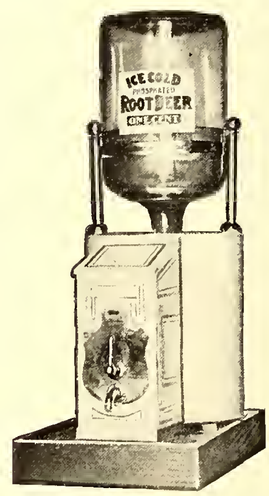
The motor is of the double-cylinder type, each cylinder 4⅛ ins. x 5⅛ ins., cast together, with integral water-jacket and valve chambers. The vaporizer, which is known as the "1000-mile" type, has a float feed, with automatic auxiliary air valve, and is jacketed with warm water. For the control are used a spark lever on the steering wheel column and an accelerator pedal at the base of the steering column. Double and triple ball bearings are employed throughout. The rear wheels have a side chain drive. The front axle is made of extra heavy weldless steel tubing with drop-forged steering knuckles. The front wheels run on roller bearings and the steering knuckles turn on ball bearings. Solid 2-in. square forged steel is used for the rear axle, and the wheels of the latter run on roller bearings. The front springs, which are two in number, are of the semi-elliptical type, as are also the three rear springs. The front wheels are 32 ins. in diameter and the rear wheels 34 ins.; all have 3½-in. solid rubber tires.

Ordinary braking is accomplished through the medium of a foot pedal which is clamped on the outside of the rear wheel drums. The emergency brake, which is operated by a hand lever, expands against the inner surface of the same drums. The emergency brake lever is provided with a notched quadrant to lock the brakes whenever necessary.

While the truck described represents one of the standard types made by the company, it is prepared to incorporate in new trucks such changes as may be needed to satisfy special requirements.

AUTOMATIC LIQUID-VENDING MACHINE

The profitable uses to which automatic vending devices may be put seems to be without limit, judging by some of the latest inventions in this field, among which is the drink-serving device made by the Liquid Vending Machine Company, of New York. As may be seen by reference to the accompanying illustration, a carboy having a total capacity of 200 drinks is placed neck down over an ice tank, which is so arranged that there are sixteen ice-cold drinks ready at all times. One glass of liquid is obtained by inserting the proper coin in the slot and turning the faucet.



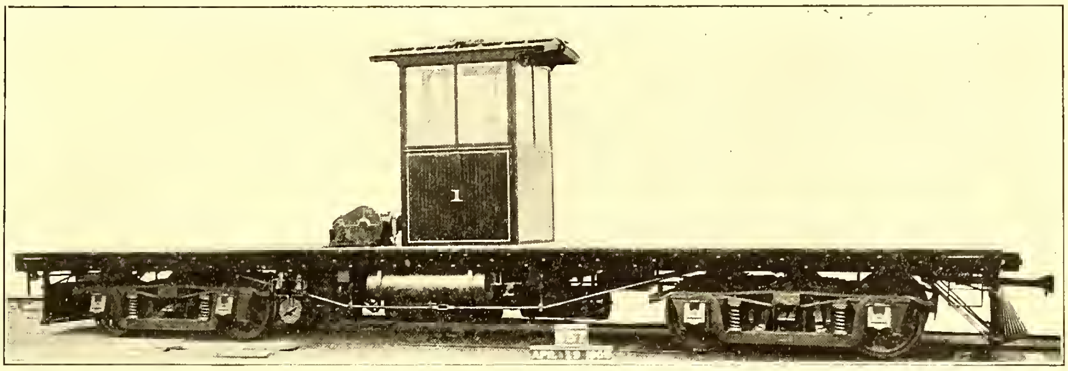
A NOVEL LIQUID-VENDING MACHINE

This machine proved a good investment at the St. Louis Exposition, paying a profit of some 70 per cent. It has met with similar success in ferry houses, railway stations and other public places, so there is no good reason why it should not turn out a profitable attraction in summer parks, provided the machine is kept in good condition.

The new cars of the Fort Wayne & Wabash Valley Traction Company, which on June 1 are to be put on the Fort Wayne & Indianapolis limited runs, are to be christened with the names of Scott's novels. The three cars first out will be known as the Ivanhoe, Woodstock and Talisman. The new and elegant private car being built for President Jones, of the company, will be named the Lawton, in honor of the soldier hero, long a resident of Indiana, who was killed in the Philippines.

SINGLE-PHASE LOCOMOTIVE AND CONSTRUCTION CAR

The American Car Company is shipping to the Vallejo, Benecia & Napa Valley Railway Company, California, an interesting construction car, intended for use with Westinghouse single-phase motors. This locomotive, or car, is powerfully constructed, is capable of drawing heavy loads, and also has a large carrying capacity. The road is now in process of construction, and the new car will be found exceedingly useful at this time.



SINGLE-PHASE LOCOMOTIVE AND CONSTRUCTION CAR TO BE USED BY THE VALLEJO, BENECIA & NAPA VALLEY RAILWAY COMPANY

The sill plates extend the full length of the sills, and four undertrusses have queen posts set under heavy needle beams. The motorman's cab in the center is 4 ft. 4 ins. x 3 ft. 10 ins., and has a single swing door. Channel-iron draw-bars, pilot on each end of car and "Dedenda" gong, of Brill manufacture, are included in the equipment. The car is 40 ft. over the end sills, and the width over sills, including plates, is 8 ft. 10 ins. The side sills are 5½ ins. x 7¾ ins., and the end sills are 5½ ins. x 7¾ ins. The sill plates are 8 ins. x ⅝ in. The trucks are the company's No. 23-B type of M. C. B. truck, having a wheel base of 6 ft. 4 ins. and 33-in. wheels.

SEMI-CONVERTIBLE CARS FOR SPOKANE, WASH.

The Spokane Traction Company, Washington, has quite recently received eight semi-convertible cars built by the American Car Company. The regular winter equipment of the Spokane Traction Company is about thirty cars, but a number of extras are placed on the lines in summer. The falls of the Spokane River furnish the power for the cars as well as for the industries of the city. Spokane is the center of a wheat producing section and of the mineral district of Eastern Washington, and there is not another large town within 300 miles of it.

As the illustrations show, the new cars have the semi-convertible window system, permitting the windows to be held at any height or raised entirely into the roof pockets. Cars of this type, as well as of the full convertible type, have been in use in and about Spokane for some time, and have given the highest satisfaction. Reversible back seats of spring rattan, having

DOUBLE-VESTIBULE SEMI-CONVERTIBLE CAR FOR THE SPOKANE TRACTION COMPANY

corner grab handles, are used, and forty passengers may be comfortably seated. The interiors are pleasingly finished in ash, with ceilings of decorated birch. Besides the regular 12-in. x ⅜-in. steel sill plates, the vertical strain at the center and ends is counteracted by undertrusses and low inside trusses. The trucks are of the Brill No. 27-E style, with a 4-ft. wheel base and 33-in. wheels. The equipment includes Brill angle-iron bumpers, "Dedenda" gongs, channel-iron draw-bars, vertical bronze brake wheels, track scrapers and steps, and the American Car Company's sand boxes and "Minneapolis" signs.

The length over the end panels is 30 ft. 8 ins., and over the crown pieces, 40 ft. 1 in.; from the panel over the crown, 4 ft.

SEATING ARRANGEMENT OF SPOKANE CAR

8½ ins.; width over the sills, including facing, 7 ft. 11½ ins., and over the posts at the belt, 8 ft. 2 ins. The sweep of the posts is 1¾ ins.; distance between the centers of the posts, 2 ft. 8 ins.; side sill size, 4 ins. x 7¾ ins., and end sill size, 5¼ ins. x 6⅞ ins.; sill plates, ⅜ in. x 12 ins. The thickness of the corner posts is 3¾ ins., and of the side posts, 3¼ ins. The seats are 36 ins. long and the width of the aisles is 22 ins.

DELEGATES TO INTERNATIONAL CONGRESS VISIT LEXINGTON, KY.

On May 17 a party of delegates to the International Congress was given a side trip into Kentucky from Cincinnati, Ohio, to Lexington, through the courtesy of the Queen & Crescent Route, the Lexington Railway Company and the Blue Grass Traction Company. About 200 delegates made up the party. They stopped at Elmendorf, the famous Blue Grass farm of J. B. Haggin, which is about 9 miles out of Lexington, on the Lexington & Paris division of the Blue Grass Traction Company. Here a typical Kentucky reception was given to the delegates by Charles Berryman, manager for Mr. Haggin. After the lunch the delegates were shown over the ranch, which consists of some 3000 acres of blue grass land, in carriages and automobiles. As there are more than 2000 horses on the farm, a horse show was furnished of ample dimensions. One hundred yearling colts were shown together. In the afternoon the return trip was made to Lexington and to Cincinnati. On arriving at the Southern Railway station in Lexington, the party was transferred to trolley cars of the Lexington Railway and the Blue Grass Company, and transferred over these lines to Elmendorf.

DELEGATES OF THE INTERNATIONAL RAILWAY CONGRESS AT SCHENECTADY

The special Pullman train bearing the members of the first party of foreign delegates who have been in attendance at the International Railway Congress at Washington, arrived in Schenectady at 8 o'clock Saturday morning, May 20. There were sixty in the party. The train was taken to the works of the General Electric Company, where the delegates were met by a reception committee of officials and interpreters, who escorted them through the General Electric Company's works.

A GROUP OF DELEGATES INSPECTING THE ELECTRIC LOCOMOTIVE AT SCHENECTADY

The delegates were specially interested in the new large machine shop devoted entirely to the construction of Curtis steam turbines. At 10 o'clock the delegates re-entered their train and were taken to the works of the American Locomotive Company, where representatives of that company escorted them about. The striking feature at this place was the sight of fourteen modern steam locomotives, representing part of one week's shipment from these works.

Luncheon was served at 11:45 in one of the locomotive company's new buildings. At the close of the luncheon, the party was joined by the ladies, who had meantime been for a drive through the city and out to the Mohawk Golf Club, where luncheon was served. The entire party re-embarked in their train, which was then taken out on the New York Central tracks, where the electric locomotive built by the General Electric Company and the American Locomotive Company was exhibited. The first view of the electric locomotive was had when it passed the visiting party of delegates at a speed of nearly 70 m.p.h. It so happened that the Lake Shore Limited passed at a high rate of speed on another track, going in the opposite direction, before the electric locomotive with its train, and the comparison between the noisy operation of the steam locomotive and the quiet, smooth running of the electric locomotive was generally commented upon.

After a brief inspection of the locomotive, the delegates got aboard the cars comprising the train, and the train was run several times up and down the 5½-mile stretch which is equipped with a third rail. This gave all the delegates an opportunity of riding on the locomotive when in operation. A speed of more than 65 m.p.h. was reached, and the marked contrast between its smooth running and that of a steam engine at a corresponding speed was again commented upon by the railroad men. At 3 o'clock the special train bearing the delegates left for Boston.

Among the General Electric officials present were: E. W. Rice, J. R. Lovejoy, J. R. McKee, A. W. Burchard, Wm. J. Clark, W. B. Potter, G. E. Emmons, A. L. Rohrer and F. H. Gale. The officials of the American Locomotive Company present were: A. J. Pitkin, J. E. Sague, R. J. Gross, James McNaughton, J. D. Sawyer, F. J. Cole, William Dalton and others. Representing the New York Central were: F. A. Harrington, superintendent of the Mohawk Division; F. A. Currie and F. F. Kingsbury.

MEETING OF NEW YORK STATE ASSOCIATION

As announced in the last issue of the STREET RAILWAY JOURNAL, the next meeting of the Street Railway Association of the State of New York will be held at the Fort William Henry Hotel, Lake George, on June 27 and 28. The holding of the convention in the spring instead of the fall is, of course, a new departure, but it is believed the earlier date will suit the pleasure and convenience of the street railway men as well as the supply men even better than the usual time in the fall. The Fort William Henry Hotel has recently passed under new management, and those in charge promise everything in the way of hotel accommodations and conveniences that can possibly be desired. The executive committee of the New York State Association is arranging an excellent programme, which will include a number of delightful excursions for the ladies, and it is confidently predicted that the meeting will even surpass the high standard set for the New York State conventions in the past. There will be four papers on practical subjects, and one session will be given to a discussion of a Question Box. Special arrangements are being made for the convenience of supply men desiring to make exhibits, and it is hoped that many of the supply houses will endeavor to send representatives and displays. The programme in detail will be published in an early issue of the STREET RAILWAY JOURNAL.

Newspaper men along the line of the Detroit, Ypsilanti, Ann Arbor & Jackson Railway were taken over the line from Battle Creek to Detroit on May 12, and a banquet was served in their honor at the Russell House in Detroit. After dinner the party was taken to the Detroit Opera House. Superintendent of Transportation James L. Millspaugh and Elmer C. Allen, auditor for the road, entertained.

The Wabash System is following the example of the Clover Leaf, and is increasing its business by making alliances with electric roads. The Wheeling & Lake Erie, a Wabash road, is interlining with the Lake Shore Electric, and tickets are sold to Pittsburg and Chicago and intermediate points from stations on the Lake Shore Electric. The steam road has also made an arrangement with the Canton-New Philadelphia Railway Company whereby tickets are sold from Canal Dover and New Philadelphia to Cleveland, transfer to the steam road being made at Navarre.

FINANCIAL INTELLIGENCE

Wall Street, May 24, 1905.

The Money Market

There was no appreciable change in the local money market this week. The tone of the market throughout was decidedly easy, despite the further heavy losses sustained by the banks, and borrowers experienced no difficulty in securing all necessary accommodations at the recently quoted rates. Money on call was in abundant supply, at rates ranging from 2½ to 2 per cent, with the bulk of the business transacted at 2¼ per cent. In the time loan department the volume of business was quite small, borrowers generally being disposed to take advantage of the extremely low rates prevailing in the call loan department. The banks and other lenders, however, were not inclined to press these funds upon the market, and all transactions reported were upon the basis of 3¼ per cent for three and four months, and 3½ per cent for six months. A feature of the market was the heavy inquiry for prime mercantile paper. Dealers reported an active demand from banks and other institutions, but the supply was very moderate, owing to the prompt collections throughout the country, which make it unnecessary for merchants to enter the market to any great extent. Some exceptionally good names were discounted as low as 3½ per cent, but the general market quotations remained unchanged at from 3¾ to 5 per cent, according to endorsement. The bank statement published at the close of last week made an extremely poor showing. The increase of $20,759,900 in the loan item was probably due to the operation of underwriting syndicates. There was a decrease in cash of $4,759,600. Deposits increased $14,932,000. The reserve required was $3,733,000 more than in the previous week, which, added to the loss in cash, resulted in a decrease in the surplus reserve of $8,492,600. The surplus now is $8,219,975, as against $13,004,275 in the corresponding week of 1904, $9,222,725 in 1903, $14,301,450 in 1902, $21,253,050 in 1901, and $18,812,325 in 1900.

At the close there was nothing in the situation calculated to materially change the present easy condition. Sterling exchange ruled firm around 4.8715 for prime demand bills, but the rate is yet considerably below the gold export point. Arrangements for making the final payment on account of the £15,000,000 Japanese 4½ per cent bonds have practically been completed, so that the banks will not be called upon to meet any further heavy demands until early in July, when the remaining 25 per cent of Government deposits become due under the recent call of the Secretary of the Treasury. On the other hand, the supply of funds is likely to be materially increased by the influx of currency from the interior, and by the arrival of gold from the Klondike, which should soon begin on a fairly large scale. The foreign markets continue easy. At London the open market discount rate rules at 2⅛ per cent. At Berlin the rate is 2¼ per cent, and at Paris 1½ per cent.

The Stock Market

Extreme weakness characterized the stock market this week, values declining sharply under heavy selling pressure. In the early dealings the market showed some irregularity, strength being exhibited in some issues, while in other quarters of the market decided heaviness prevailed. In the subsequent dealings, however, there was heavy liquidation, chiefly by the professional element, which was continued practically throughout the entire week, and which carried prices in many instances to the lowest points attained thus far this year. Early in the week prices were influenced to some extent by the less favorable reports concerning the iron and steel industry, and by exaggerated reports of damage to the winter wheat crop, the latter resulting in a sharp advance in the price of that cereal. Otherwise the new developments were in the main favorable. The foreign situation was greatly improved. Money here ruled extremely easy, despite the heavy decrease in the surplus reserve, and the reports from the Western traffic managers were extremely encouraging. These factors, however, were entirely ignored. At the opening of the present week the market was under renewed pressure, selling being accelerated by reports that a local institution was in financial difficulties. A noteworthy feature of the week was the heavy selling of the steel stock by commission houses and by London, which carried the common down to 25 and the preferred 90¾. In the railway list there were sensational declines in Northern Pacific and Great Northern preferred. Union Pacific touched 115 and St. Paul sold at 168⅝. At the close the liquidation was less urgent, and on the announcement that the Merchants' Trust Company had been closed by the State Banking Department, prices rallied rather sharply, but in the final dealings some of the improvements were lost. The bond market was less active, and prices generally reflected the weakness in the stock market.

The local traction issues displayed considerable strength early in the week, but later prices ran off in sympathy with the decline in other quarters of the market.

Philadelphia

Moderate activity, accompanied by sharp price fluctuations, characterized the local market for street railway issues this week. In the early trading the market displayed some degree of firmness, but in the subsequent dealings prices for practically all of the speculative issues yielded to rather heavy pressure. United Gas & Improvement was by far the over-shadowing feature of the trading, both as regards activity and price movements. Opening at 116½ the price ran off to 113¾, but later advanced sharply to 119, on what was called good buying. Later there was a further rise to 121, on the announcement that the Council had decided to extend the company's lease of the city gas works. In the subsequent dealings, however, heavy selling developed, which carried the price to 110, from which there was a feeble rally to 110½, which was the closing figure. Upwards of 50,000 shares were dealt in. Philadelphia Rapid Transit was active and weak, the price declining from 34⅛ to 32 on the exchange of about 11,000 shares. The selling was said to be for the account of New York interests. Philadelphia Company common declined from 44⅛ to 42½, on the sale of about 2500 shares, while small lots of the preferred brought 48½ and 48. Philadelphia Traction was quiet but steady, at 100⅛ to 100¼. A conspicuous feature of the trading was the strength in Union Traction, which established a new high record at 63, and closing within ½ point of the highest. About 5000 shares of the stock changed hands. Other transactions included Union Traction of Pittsburg preferred at 56, Consolidated Traction of New Jersey at 82¾ to 83¾. Railways General at 2⅞, American Railways at 52 to 51¼, United Companies of New Jersey at 271, United Railways of San Francisco preferred at 82, and Fairmount Park Transportation at 20.

Chicago

It is stated that a basis for the terms on which the traction companies will sell control of the properties to the city is now being worked out, and it is possible that the railway companies will be able to give their terms to Mayor Dunne and other representatives of the municipal government of Chicago in about three weeks.

Little interest was manifest in the local street railway issues this week. Trading continued upon an extremely small scale, and was confined almost exclusively to the stocks of the elevated roads. Metropolitan common and preferred opened firm at 23 and 62 respectively, but toward the close prices ran off, the first-named to 22 and the preferred to 61½. Chicago & Oak Park preferred held steady at 21½, and Northwestern, on purchases of about 400 shares, rose from 21½ to 22½. South Side Elevated jumped up from 90⅛ to 92, on the exchange of less than 300 shares. West Chicago sold at 45 for a small lot.

Other Traction Securities

Extreme dullness prevailed in the Baltimore market, but prices, with few exceptions, held steady. Dealings in the United Railway issues were unusually small, about $21,000 of the 4 per cent bonds selling at 92½ to 92¼, while only about $13,000 of the incomes were traded in at 59 to 58¾. Norfolk Railway & Light 5s sold from 92½ to 91½, and 500 shares of the stock brought 13. Other transactions included City & Suburban 5s at 114¾, and Baltimore Traction 5s at 100¼. The Boston market reflected to a great extent the conditions prevailing in the New York market. Trading was comparatively quiet, and was attended with a generally lower range of values. Boston Elevated opened at 158⅛, and on rather light pressure the price declined and closed at 157. Massachusetts Electric declined from 17 at the opening to 16¼, but later recovered all of the early loss. The preferred dropped from 62 to 59¾, on the exchange of about 700 shares. Boston & Worcester issues were very quiet, the common selling from 31 to 30, and back to 30¼, while the preferred declined from 78 to 77. West End common was strong, with transactions at prices ranging from 96 to 96½. The preferred was unchanged at 116. In the New York Curb market, New Orleans Railway, new common and preferred, both made new high records, the first-named selling as high as 37 and the preferred at 80½. In the subsequent dealings, however, prices ran off rather sharply, in sympathy with the weakness in the general market, but at the close there were substantial rallies, the common selling at 36¼ and the preferred at 78¼. About 4000 of the common and about 2000 preferred were dealt in. The 4½ per cent bonds were fairly active, $44,000 changing hands at from 92 to 91. Interborough Rapid Transit continued to show irregularity, about 5000 shares changing hands, at prices ranging from 205 to 198¼, the final transaction taking place at 199½. Public Service Corporation certificates sold to the extent of $30,000, at 71, and $50,000 of the 5 per cent notes brought 97⅝ and interest.

Tractions are very quiet in Cincinnati. One explanation is that investors are holding back for the issue of the preferred stock of the new Ohio Union Traction Company, which will take over all the Widener-Elkins interests in this district, and a large block of whose stock will be disposed of in this market. Toledo Railway & Light continued in demand and moved up to 34½. Cincinnati, Dayton & Toledo also braced up to 23¾, a new high point. Cincinnati Street Railway made a slight gain to 148½. Northern Ohio Traction & Light 4s sold at 69½, an advance of 2 points. Detroit United advanced from 87¼ to 89.

At Cleveland, Northern Ohio Traction & Light featured again and about a thousand shares changed hands at 22½, strengthening a fraction of a point on strong demand the early part of this week. The 4 per cent bonds of this company advanced to 70 on sales of $35,000 worth, and the 5s sold at 83, high marks for both. Aurora, Elgin & Chicago strengthened to 18 for the common, but declined to 15⅞ on Tuesday of this week, indicating a veer of sentiment in regard to the stock. The 5 per cent bonds of this company were in strong demand; about $60,000 worth selling at 90 to 91⅝. Cleveland Electric was erratic as usual owing to the franchise controversy. It sold as high at 80½, but on Tuesday of this week, owing to the fact that all deals were off, it had dropped to 78. A sale of Cleveland & Southwestern common was made at 9½, a gain of 2 points from last sale. Detroit United was active at 89 to 89½.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	May 17	May 24
American Railways	51	51
Boston Elevated	157½	156
Brooklyn Rapid Transit	61⅝	57½
Chicago City	a195	190
Chicago Union Traction (common)	6⅞	6½
Chicago Union Traction (preferred)	—	30
Cleveland Electric	83	—
Consolidated Traction of New Jersey	—	83
Consolidated Traction of New Jersey 5s	109	109
Detroit United	88	88
Interborough Rapid Transit	204¼	199½
International Traction of Buffalo	25	25
International Traction of Buffalo (preferred)	a64½	a64¼
International Traction of Buffalo 4s	82½	82½
Manhattan Railway	164½	161¾
Massachusetts Electric Cos. (common)	16¼	16
Massachusetts Electric Cos. (preferred)	65	58
Metropolitan Elevated, Chicago (common)	21	22½
Metropolitan Elevated, Chicago (preferred)	60	60½
Metropolitan Street	116	114⅜
Metropolitan Securities	76⅛	75¾
New Orleans Railways (common), W. I	35⅛	35½
New Orleans Railways (preferred), W. I	79⅛	77
New Orleans Railways, 4½s	91	90¼
North American	100⅝	98⅝
North Jersey Street Railway	25	25
Philadelphia Company (common)	43⅞	42⅜
Philadelphia Rapid Transit	33¾	31⅞
Philadelphia Traction	100	100
Public Service Corporation 5 per cent notes	97	97
Public Service Corporation certificates	70½	70½
South Side Elevated (Chicago)	92	91
Third Avenue	126	125
Twin City, Minneapolis (common)	112⅝	108½
Union Traction (Philadelphia)	61¼	62
West End (common)	96	95½
West End (preferred)	116	116

a Asked. W. I., when issued.

Iron and Steel

The "Iron Age" says that at all leading distributing centers the pig-iron market is very quiet. No sales of any consequence for forward delivery have taken place, but there is a fair volume of orders for early delivery, and consumers are taking their iron on old contracts steadily. Production has been very slightly in excess of requirements, but that does not mean that consumption is not going on at an unprecedented rate. Sentiment has changed, however. Prices are weaker, and buyers are holding off, convinced that a somewhat lower level in pig iron will be reached. Steel billets are somewhat easier, and it is worthy of notice that the leading interest is again offering more freely abroad.

YOUNGSTOWN & SOUTHERN SOLD

The controlling interest in the Youngstown & Southern Railway Company has been sold by A. W. Jones, J. R. Long, W. S. Anderson, J. H. Ruhlman and W. H. Ruhlman, the original promotors, to a syndicate composed of John Stambaugh, Warner Arms, H. H. Stambaugh, R. C. Steese, C. H. Boothe, A. M. Clark, Richard Garlick, David Tod, R. P. Hartshorn and others of Youngstown. With them in the syndicate are C. P. Phelps & Company, and Baker, Ayling & Company, of Boston, who represent Eastern stockholders. Officers have been elected as follows: John Stambaugh, president; C. P. Phelps, first vice-president; S. J. Dill, second vice-president and general manager; F. D. Wilkerson, secretary-treasurer; E. L. Lincoln, assistant treasurer. F. D. Wilkerson is chairman of the executive committee. The road is now in operation from Youngstown to Columbiana as a steam road, and it will be extended to Salem, Lisbon and East Liverpool, and equipped for third-rail operation as originally contemplated. J. H. Ruhlman, who has been in charge of the work, will continue with the company.

CONSOLIDATION OF PUBLIC SERVICE COMPANIES AT COLUMBIA, S. C.

Preliminary agreements have been made for the consolidation of the Columbia Water Power Company and the Columbia Electric Street Railway, Light & Power Company, of Columbia, S. C., and meetings of the shareholders of the two companies have been called for June 15 to ratify the terms of merger. The plan provides for the acquisition of the property and franchises of the Water Power Company by the Street Railway Company, which will then be capitalized at $600,000 of preferred stock, and $1,000,000 of common stock, and (with the retirement of its present bonded debt of $700,000) an issue of $2,000,000, 5 per cent, 30-year gold bonds secured by mortgage of the combined properties to the Mercantile Trust & Deposit Company, Baltimore, trustee. Of the new bonds $1,600,000 are to be sold and $400,000 reserved for improvements and for redemption at maturity of the $200,000 bonded debt of the Water Power Company. The Columbia Water Power Company was organized in 1891, and has developed 10,000 hp at Columbia, its power station being located on the river at the foot of Gervais Street. It is capitalized with $600,000 stock, and has a floating debt of about $500,000, and no bonded debt except $200,000 of 6 per cent bonds maturing in 1918 and 1919, assumed in the purchase of the Columbia Canal. E. W. Robertson, of Columbia, S. C., will be president of the consolidated company, which will retain the name of the Columbia Electric Street Railway, Light & Power Company.

IMPORTANT CONSOLIDATION IN GERMANY

On May 4 the stockholders of Felten & Guilleaume Carlswerk Aktien-Gesellschaft, of Mulheim-on-Rhine, ratified the purchase by the managers of that company of the manufacturing portion of the Elektricitäts-Aktien-Gesellschaft, vorm. Lahmeyer & Company, of Frankfort-on-Main. The title of the new firm is Felten & Guilleaume-Lahmeyer-Werke Aktien-Gesellschaft, and the capital has been increased from Marks 36,000,000 to Marks 55,000,000. The new stock is issued at 110. The Elektricitäts-Aktien-Gesellschaft, vorm. Lahmeyer & Company, will continue its existence, but as a financial concern, and will operate in harmony with the new consolidated manufacturing company.

The Felten & Guilleaume Company is one of the largest manufacturers of wire products in the world, and was incorporated in 1900 as successor to the firm of Felten & Guilleaume, which had been in existence for more than seventy-five years. During this time the control of the property has been in the hands of the Guilleaume family, and it is understood that this will still be the case. During the five years since its incorporation the company has paid dividends at the rates of 10, 0, 5, 5 and 8 per cent. The company has 5000 employees. The Lahmeyer Company has been engaged in the past principally in the manufacture of dynamos and other electrical machinery, and its machines have been extensively used. By the consolidation of these two companies the new corporation is in a very prominent position and bids fair to be an important factor in the electrical manufacturing industry of Germany.

STATEMENT TO MASSACHUSETTS LEGISLATURE OF NEW HAVEN'S ELECTRIC RAILWAY HOLDINGS

A communication from the Railroad Commissioners was filed in the Massachusetts House this week in response to the order requesting information as to the amount of stock in Massachusetts street railways owned or controlled by the New York, New Haven & Hartford Railroad Company.

In this statement are included communications from the officers of the various street railways showing the stockholders of record. Of the 7000 shares of capital stock of the Worcester & Southbridge Street Railway Company, 6982 shares are owned by Charles S. Mellen, of New Haven, Conn., president of the New York, New Haven & Hartford Railroad; of the 10,000 shares of capital stock of the Berkshire Street Railway Company, 940 shares each are owned by the following persons: D. Newton Barney, of Farmington, Conn.; Charles F. Brooker, of Ansonia, Conn.; James S. Hemingway, of New Haven, Conn.; H. M. Kochersperger, of New Haven, Conn.; E. H. McHenry, of New Haven, Conn.; C. S. Mellen, Arthur D. Osborne and Calvert Townley, of New Haven, and William Skinner, of Holyoke, 798 shares being held by the Consolidated Railway Company. Of the 19,584 shares of the Springfield Street Railway Company, 17,852 are held in Massachusetts, being distributed in small blocks; 565 shares are held in Connecticut, the balance being generally distributed throughout the country.

The statement also includes a further communication from President Mellen of the New York, New Haven & Hartford Railroad as to its holdings, this saying:

"On May 1, 1905, the New York, New Haven & Hartford Railroad Company owned 100,000 shares, being all of the capital stock of the Consolidated Railway Company. These shares were acquired as follows:

June 3, 1903, Worcester & Connecticut Eastern Railway Company	2501 shares
May 27, 1904, Worcester & Connecticut Eastern Railway Company	2499 "
	5000 "

On June 30, 1904, the above shares of the Worcester & Connecticut Eastern Railway Company were exchanged for an equal number of shares of the Consolidated Railway Company, owing to the change in name of the company to the latter.

June 30, 1904, the Consolidated Railway Company issued an exchange for the capital stock of the Fairhaven & Westville and Winchester Avenue Electric lines, of New Haven, and the Meriden electric system, of Meriden, 92,000 shares.

October 1, 1904, the Consolidated Company issued an exchange for capital stock of the Stamford Electric Company, 3000 shares, making a total of 100,000 shares.

The foregoing covers all of the stock owned by the New York, New Haven & Hartford Railroad Company in any and all electric or street railway companies.

April 1, 1905, the New York, New Haven & Hartford Railroad Company acquired by purchase $3,500,000 par value of the debentures of the Consolidated Railway Company. These debentures were purchased of the company to put it in funds for the purpose of enabling it to purchase the securities of the Hartford Street Railway Company and the East Hartford & Glastonbury Horse Railway Company.

The above comprises all the debentures, bonds, or evidences of indebtedness owned by the New York, New Haven & Hartford Railroad Company of any and all electric or street railway corporations.

The increases in the capital stock of the New York, New Haven & Hartford Railroad Company since Jan. 1, 1900, have been as follows:

Number of shares outstanding May 1, 1905	800,000
Number of shares outstanding Dec. 31, 1899	546,853
Number of shares issued since Jan. 1, 1900	253,147

THE CHICAGO & ALTON RAILWAY'S GASOLINE CAR

Much ado has been made in the daily press about the large order for gasoline-electric motor cars said to have been placed by the Chicago & Alton Railway Company with the intention of putting the cars on its lines in competition for traffic with the various electric railways paralleling portions of its line between Chicago and St. Louis. These reports have been run to earth, and are found to be greatly exaggerated. The company has under construction in its own shops at Bloomington, Ill., one gasoline-electric motor car, which is considered entirely as an experiment.

CLEVELAND ELECTRIC MAKES A PROPOSITION

At a meeting this week the directors of the Cleveland Electric Railway Company formally declined to present to the stockholders Mayor Johnson's scheme for leasing the property to an operating company representing the city. The directors stated that they could not recommend giving over control of the property to a "paper company;" that is, a company without financial responsibility and backing and managed by a committee whose powers would be autocratic, and in no way subject to the suggestions or petitions of the city or the stockholders. In return the company offered two propositions. One provided for five-cent fare, six tickets for a quarter, free transfers and the payment to the city of one-half of the net income over and above fixed charges, and the payment of a 5 per cent dividend on the capital stock, including such new capital as may be invested from time to time, at periods of five years, the other half of the amount to be applied to a sinking fund for betterment to the property. As an alternative to the dividend proposition, the company agreed to give eight tickets for a quarter and free transfers during one hour of densest traffic morning and evening. In either case the company asked to be relieved of special taxes, including bridge, paving and license fees.

The propositions were presented to the City Council Monday evening and were bitterly opposed by Mayor Johnson. On a vote of 17 to 16 the proposals were tabled.

NO MOVING PLATFORM IN NEW YORK—TUNNEL TO LONG ISLAND CITY

At a meeting of the New York Rapid Transit Commission held last Thursday, action was taken which complicates still further the tunnel situation in that city. First it was decided finally to reject the proposition to construct a moving platform in Thirty-Fourth Street as advocated by interests identified with the Interborough Rapid Transit Company, which operates the elevated and the subway lines in New York. Then came the move that has created so much talk. The commission adopted elaborate plans proposed by New York City Railway interests to extend the original routes of the Thirty-Fourth Street line to include a line under the East River to Long Island City. This crosstown subway and tunnel, as approved by the commission, will extend from Eleventh Avenue, in Manhattan, to Jackson Avenue and Fifth Street, in Long Island City, a point beside Newtown Creek, which divides Long Island City from Brooklyn. The road will have four tracks across Manhattan and two tracks under the river and in Queens.

As laid down formally by the commission, the crosstown subway with its Queens connection will be offered to bidders in three sections. One will be from Eleventh Avenue in Manhattan to Ninth Avenue, the second from Ninth Avenue east to East River, and the third section will be the tunnel under the river. It is proposed to have the East River tunnel section descend from the grade of the crosstown section at a point between Second and Third Avenue. The river section will run under private property to the East River at Thirty-Fifth Street, and in the borough of Queens will run under Borden Avenue to the yards of the Long Island Railroad, two blocks away from the passenger station. The tracks will be brought to the surface beside Newtown Creek at Jackson Avenue and Fifth Street, and may be extended at any time throughout Queens Borough. By taking the tracks across Newtown Creek an entrance would be effected to Brooklyn Borough.

AFFAIRS IN CHICAGO

John J. Cummings, the president of the McGuire-Cummings Manufacturing Company, of Chicago, who has made an offer to the city to equip and operate the so-called Adam Street line of the Old Chicago Passenger Railway Company, is reticent about divulging the names of those who are to enter the syndicate with him that will carry out his proposal. He has, however, said they are all manufacturers of street railway material, and that among them are some of the largest in the business. He emphatically denies that any street railway officials of Chicago or any other city are interested in the proposals. Mr. Cummings says that $500,000 has already been subscribed, and that certified checks totaling that amount are in escrow, subject to return should the city not accept the proposal. The proposal, it will be remembered, is to take over and operate the line on a license, as provided by the Mueller law, for a certain compensation to the city, until such time as the validity of the Mueller certificates is assured by the decision of the court. Then the properties will be turned over to the city in return for these certificates.

INTERURBAN SERVICE ON THE ILLINOIS CENTRAL

Notice has previously appeared in these columns of the so-called interurban service started by the Chicago & Alton Railway between certain points in Illinois. The Illinois Central Railroad has started a similar service between Flossmoor and Kankakee and between Decatur and Bloomington. The service between Flossmoor and Kankakee is really a kind of an extension of the Chicago suburban service which terminates at Flossmoor. This interurban service is given with light trains and locomotives. Four trains each way are run per day. Stops are made at all the principal highway crossings upon signal. Interurban rates are based on two cents per mile one way, and one and a half cents per mile round trip. The method of carrying on the ticket business is almost identical with that most commonly used by interurban electric roads. Round trip tickets are sold by conductors from stations where there are no ticket agents. No baggage is carried or checked on these trains. It is expected that later the company will experiment with gasoline motor cars, one of the officers of the company having reported favorably upon such an experiment after visiting the car recently built by the Union Pacific Railroad.

THE PHILADELPHIA & WESTERN RAILWAY

Construction work upon the Philadelphia & Western Railroad is actually under way. The line will, it is said, be constructed between the Philadelphia city line and Wayne during the summer, so that cars may be run by Oct. 1. The road will be double-tracked, and laid with 85-lb. T-rails. There will be twenty-nine over and under crossings of highways, but none at grade. The Southeastern Construction Company is in charge of the work, and after the section from Philadelphia to Wayne is completed, construction upon a further extension to Parkesburg will begin. It is said that both steam and electric cars will be run upon the road, although the former will be run only in sufficient number to make the charter, which is for a steam railroad, legal. The St. Louis Car Company is understood to have secured the contract for furnishing the cars. Connections will be made at Sixty-Third and Market Streets, Philadelphia, with the new Philadelphia Rapid Transit subway and elevated line, to the Philadelphia City Hall. Cars may, perhaps, be run all the way in to the center of the city, under a traffic arrangement.

NEW YORK RAILROAD & DEVELOPMENT ASSESSMENT

At a meeting of the directors of the New York Railroad & Development Company, which is the financing and construction company of the New York & Port Chester Railroad, held last week, an immediate call of $1,000,000 was made, to be applied to the payment of real estate for right of way, etc., already purchased and contracted for, and other real estate immediately required to start the work. The executive committee, composed of J. H. Harding, John W. Gates, Charles W. Morse, D. H. Morris and Geo. R. Sheldon, was authorized to call such additional future assessments as may be required to push the work. The officers of this company are Charles W. Morse, president; J. H. Harding, vice-president, and David H. Morris, secretary and treasurer. W. C. Gotshall, the president of the New York & Port Chester Railroad, is the active executive of the enterprise. The sub-contractors for the earthwork and masonry will be sent into the field so soon as all of the right of way real estate is secured, so as to thereby avoid interruption when the work is started. Oakleigh Thorne, representing the Trust Company of America, will enter the board in the near future, as will also a representative of Harvey Fisk & Sons. The plan is to build a four-track third-rail electric railway from a connection with the subway in Harlem, New York, to Port Chester, a distance of 27 miles.

FIRST SINGLE-PHASE LINE ON COAST

The Vallejo, Benecia & Napa Valley Railway Company's electric system is completed from Vallejo to Napa, and will be ready for operation in a few days. A successful test of the Napa sub-station equipment was recently made under the supervision of manager H. H. Smith and electrician H. W. Crozier. An electric locomotive has been shipped from St. Louis, to be followed by the electric cars. A line of fast steamers will connect at Vallejo, so that six round-trips can be made daily between Napa and San Francisco. The opening of this road will excite especial interest, because it is the first railway on the Coast to be equipped with the single-phase system. R. S. Masson is consulting engineer of the company.

TOLEDO BRIDGE OPENED

The Cherry Street bridge, at Toledo, which for a month has been closed to interurban cars, thereby keeping three of the roads out of Toledo, has been opened to them again. The city made the necessary repairs. The Mayor demanded that the companies post $5,000 each to indemnify against damage to the bridge. The companies declined, and before the matter was threshed out the City Council passed a resolution granting the companies permission to use the bridge. The Mayor attempted to stop the proceedings, but was unable to carry his point.

The Lake Shore Electric has arranged several trade excursions from points along its line to make up for the trade lost by Toledo merchants. The Council was practically forced to action by the complaints of the Chamber of Commerce and representatives of the city merchants, who found that the trade brought in by the interurbans was a very important factor in their business.

MASSACHUSETTS PRIVATE LAND BILL KILLED

The Massachusetts Senate has killed the bill "relative to the construction and operation of street railways on private lands," after having once enacted it. The bill so amended the street railway law as to permit street railway companies to purchase or lease private land for the purposes other than the avoidance of curves and grades, which are the only purposes for which they can now buy or lease. It was reported unanimously by the street railway committee, and met with little or no opposition in its various stages through the Legislature until it had been enacted. Then the steam railroad interests, which had seen other measures to which they were hostile defeated, evidently decided that this bill, too, was inimical to them, and exerted their influence to kill it. The defeated bills included both the so-called general eminent domain bill and the special bill to incorporate the Boston & Providence Street Railway Company, and the interests back of the latter, while it is claimed that they might have obtained desired privileges under the bill that was rejected, were said to have joined in the effort to defeat it on the ground that the Stone & Webster interests, because their road is already partly built, might be able to secure better advantages.

BOSTON & NORTHERN AND OLD COLONY STREET RAILWAY COMPANIES ENTERTAIN

A party of newspaper men, railroad officials and the mayors of Lynn, Salem and Beverly, on invitation of Robert H. Derrah, general passenger and advertising agent of the Boston & Northern Street Railway and Old Colony Street Railway, made a trip to Gloucester on Sunday, May 14, enjoying a fish dinner at Long Beach and a ride around the Cape. One of the company's parlor cars was used for the occasion, and under Mr. Derrah's supervision the party left Boston at 9 o'clock. At Lynn, Salem and Beverly, short stops were made to take on other members of the party. At Gloucester members of the local press joined the party, and after a few moments delay the car started for Long Beach. After dinner a short stroll around the beach was enjoyed until 3 o'clock, when the trip was resumed for a trip around the cape. On reaching Rockport, a brief halt was made, the party enjoying the hospitality of the Commonwealth Club at their quarters. The visiting delegation included Mayor Joseph N. Peterson, of Salem; Mayor Henry W. Eastham, of Lynn; Mayor Joseph A. Wallis, of Beverly; M. B. Curran, private secretary of Mayor Collins, of Boston; Robert H. Derrah, general passenger agent; Frank C. Wilkinson, general superintendent; Thomas Lees, superintendent Lowell division; Thomas B. Roberts, superintendent Gloucester division; Robert B. Chalmers, superintendent Salem division; G. J. Anderson, assistant to President Sullivan, and A. A. Richards, of the Boston & Northern, and the newspaper men.

APPLICATION MADE TO WIND UP AFFAIRS OF MIAMI & ERIE CANAL TRANSPORTATION COMPANY

As intimated in the last issue of the STREET RAILWAY JOURNAL, certain creditors of the Miami & Erie Canal Transportation Company have applied to the courts to have the affairs of the company wound up and the property sold. The Cleveland bondholders' committee, representing about $1,000,000 of bonds, are objecting strenuously to the foreclosure proceedings. They state that they are working out a plan to reorganize the company and claim it can be operated successfully. They also have hopes of still obtaining additional concessions from the State Legislature.

BROOKLYN EMPLOYEES' LUNA PARK FESTIVAL

The Brooklyn Rapid Transit Benefit Association, composed of employees of the Brooklyn Rapid Transit Company, is holding its spring festival at Luna Park, Coney Island. This year the festival extends from May 15 to June 17, about five weeks, as against three last spring and two last fall. Through the courtesy of Thompson & Dundy, the managers, the freedom of the park is virtually extended to the association, and a special line of attractions is offered at a reduced rate to association members and those who wish to avail themselves of the reduced rate through the association. As an attraction this year, A Trip to the Moon, Shoot the Shutes, Whirl the Whirl, Fire and Flames, Scenic Railway, Babbling Brook, Minature Railway, Laughing Mirrors, and entrance to the park, totaling $1.00 worth of amusement, are offered for 50 cents.

The festival is advertised extensively by the association in the cars, the elevated stations, elevated platforms and other points of vantage, and all employees are permitted to carry tickets while on duty for sale to the public. A commission is paid by Messrs. Thompson & Dundy on all tickets sold, and the income from the festival, which is considerable, is expended by the association during the winter for the educational work and in defraying the expenses of the many entertainments provided for the members, to which admission is free. Besides the efforts made by the members individually to further the interests of the association by selling tickets, a corps of able canvassers is selected by the trustees of the association from the regular men. These men, paid a regular wage by the association, are stationed at the entrance to the park to sell tickets.

On Saturday, May 27, the association band, under the direction of W. S. Mygrant, bandmaster of the 13th Regiment, will visit the park. This band was organized last fall, and meets regularly once a week. The instruments and uniforms are all furnished free by the association, as is also the instruction. Mr. Mygrant, who is one of the ablest conductors in the country, is unstinted in his praise of the organization.

On April 28, Newton W. Bolen, superintendent of districts number one and three of the Public Service Corporation, was the guest of the association at its East New York club house. Mr. Bolen has extended an invitation to the association to visit the employees of the Public Service Corporation at their club house in Jersey City, and on Thursday, May 25, officers of the company and of the association, together with the band, will go to Jersey as the guest of Mr. Bolen.

The regular election of the association for the selection of officers was held recently, and resulted as follows: Geo. F. Wolfram, vice-president; John Stall, Wm. F. Duncan, Sanfred Dyer, trustees.

In this connection it is interesting to note the methods of nominating officers and of voting. Heretofore a caucus has been held and names placed in nomination. Before the last election, however, announcement was made that the endorsement of any one man by fifty members would insure the insertion of his name on the regular ballot. Each member of the association was furnished with a numbered ballot, and when voting his number was checked off against his name. The evening of the election special cars were run from each of the depots to the polling place, which was in the club room of the East New York building. More than 2000 votes were cast.

HOLDING COMPANY FOR WIDENER-ELKINS OHIO PROPERTIES

Announcement is made by Irwin, Ballman & Company, Cincinnati bankers, of the formation of the Union Traction Company, of Ohio, as the holding company of the various interests of the Widener-Elkins syndicate in Ohio. The announcement states that the company has a capital of $20,000,000 and owns all the stock of the Cincinnati Traction Company, the Cincinnati Interurban Company, the Cincinnati Zoological Company, the Traction Building Company, of Cincinnati, the Cincinnati Car Company, one-half the capital stock of the Traction Terminal Company and a large interest in the common and preferred stocks of the Cincinnati, Dayton & Toledo Traction Company. The directors agreed upon for the new company are: Thomas Dolan, Randall Morgan, P. A. B. Widener and George Elkins, of Philadelphia; Hugh J. McGowan, W. Kesley Schoepf, B. S. Cunningham, John Kilgour, Chas. P. Taft, W. S. Roe, Louis J. Hauck, Wm. Cooper Procter, H. M. Levy and W. T. Irwin.

It is stated that the original plan announced several days ago called for a company to have a capital stock of $16,000,000, but that this had been increased to $20,000,000 to provide for the purchase and building of an elevated line from Norwood into Cincinnati under franchises secured by J. G. Schmidlapp. This elevated line will provide the much desired entrance into Cincinnati for the standard gage interurban roads.

It is evident that the Widener-Elkins interests are at work on the formation of a huge system of interurban roads in Ohio and Indiana. As is well known, the syndicate controls the Indiana Union Traction system and the Cincinnati, Dayton & Toledo, and is generally understood to be back of the Ft. Wayne, Van Wert & Lima Traction Company. Several meetings held recently at Lima indicate that W. Kesley Schoepf has allied himself with Joseph Mayer, of Buffalo, in the project of building from Lima to Toledo over the route now under construction by the latter. It is known that offers have been made to the Indianapolis & Eastern and the Dayton & Western for the lines between Indianapalis and Dayton, and to the Dayton & Troy and the Western Ohio Company for the lines between Dayton and Lima, giving a through line from Cincinnati to Toledo. The Pomeroy-Mandelbaum syndicate, which owns the Western Ohio, is not particularly anxious to dispose of its property, because it is building a line from Lima to Findlay with a view to operating through from Dayton to Toledo. Widener-Elkins interests are also said to be planning to build a line from Lima to Columbus by way of Bellefontaine, and it is well known that they are keeping an eye on the outcome of the Appleyard muddle, and it would not be surprising to see these roads pass into their hands. If all these plans are carried out, the Philadelphia syndicate will control the cream of the interurban business of the Central West. Its lines would extend from Cincinnati to Toledo, from Columbus to Indianapolis, from Columbus to Ft. Wayne; a system of more than a thousand miles, not including city lines.

REPORT OF THE LIVERPOOL CORPORATION TRAMWAYS

The Liverpool Corporation Tramways have issued an erratum sheet to their annual report, stating that owing to an error of their printers, certain statistics of traffic for 1902 and 1903, as shown in the report, became transposed. These figures were reproduced on page 760 in the April 22 issue of this paper, so that to read correctly, the first thirteen lines printed under 1902 should be considered as applying to 1903, and vice versa. The final three lines are correctly given under their respective years, and there is no change in the 1904 figures.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED MAY 16, 1905

789,715. Pneumatic Trolley Check; Andrew G. Cassidy, Waltham, Mass. App. filed Nov. 5, 1904. Pneumatic means whereby when the trolley slips off the wire, the pole will be checked in its upward movement and then drawn down below the wire.

789,754. Governor for Non-Automatic Electric Motor Controllers; William J. Napier, Leighhardt, Sydney, N. S. W. App. filed Jan. 6, 1904. Provides a locking-pawl suitably mounted in relation to a cam on the controller-spindle and pneumatic-electrical mechanism for operating this pawl, so as to advance it to engage with and lock said cam during the time that the motor is accelerating, and to retire it, so as to leave the controller spindle free to be rotated to the next notch.

789,804. Trolley Catcher and Retriever; Walter W. Geiser, Altoona, Pa. App. filed Dec. 19, 1903. Details of a spring drum and ratchet.

789,879. Brake Gear for Railroad Cars; Edward Posson, Austin, Ill. App. filed Jan. 7, 1905. A brake lever coupled between its ends to a brake-beam, and at its lower end to the lower lever connecting-rod, a link parallel to the lever and coupled to the beam and rod at points equal in distance apart to that between the connections of the lever thereto.

789,998. Brake-beam; John F. O'Connor, Chicago, Ill. App. filed Jan. 9, 1905. A brake-head for brake-beams having a recessed portion through which the brake-beam is designed to pass, and friction shoes on each side of the recess.

790,024. Fender; Summers F. Beckwith, Charleston, W. Va. App. filed Sept. 20, 1904. Details of construction.

790,058. Brake-beam; James M. Hopkins, Chicago, Ill. App. filed Feb. 20, 1905. A rolled brake-beam of I form having its flanges wider at its middle portion than at its ends.

790,096. Sand Can; August L. Ackerman, Hoboken, N. J. App. filed March 9, 1905. A can for manually applying sand to the track rails, having a guide wheel adjacent the spout and adapted to travel on a rail to be sanded.

NEW HAVEN ELECTRIFICATION

The directors of the New York, New Haven & Hartford Railroad have authorized the president to arrange to establish electric motive power for its trains in running into the Grand Central Depot, New York. The directors have been looking forward to this step for some time, since the New York Central decided to make this change for its trains. The new arrangement will require not only the purchase of electric locomotives and the establishment of a power house, but there will be necessary a big round house for the steam locomotives, where they can be housed so as to play their part in the new system.

PERSONAL MENTION

MR. E. A. CROSBY, assistant treasurer of the Twin City Rapid Transit Company, has been appointed to the position of treasurer, and Mr. Edward S. Pattee, auditor of the company, has been made secretary.

MR. P. M'CRORY, president of the Toledo, Port Clinton & Lakeside Railway Company, has sold his interests in the company to Captain D. H. James, and has resigned from the management. Mr. McCrory was actively in charge of the building of the road. He will go to Arizona to recuperate.

MR. THOMAS L. HACKETT, general passenger agent for the Grand Rapids, Grand Haven & Muskegon Railway, with headquarters at Grand Rapids, has severed his connection with the road and accepted a position in Montgomery, Ala. R. J. Kelley becomes freight agent for the road. General Manager Morley will look after the passenger business.

MR. G. A. RICHARDSON, of Lynn, Mass., has been made assistant superintendent of the Houghton County Street Railway Company, of Hancock, Mich., and will have charge of the Calumet division of the road. Transportation across Portage Lake will be provided to passengers of the company's lines by one of the established ferry lines, without extra cost.

MR. WILLIAM R. MILLER, superintendent of the Cumberland & Westernport Electric Railway, with headquarters at Frostburg, has tendered his resignation to take effect May 31. Mr. Miller will go to Danville, Pa., to take charge of the Danville & Bloomsburg Electric Railway as general manager. Mr. Miller became connected with the Cumberland & Westernport Electric Railway on March 23, 1903.

MR. R. P. STEVENS has been appointed to the position of general superintendent of the Auburn & Syracuse Electric Railway, of Auburn, N. Y. Mr. Stevens formerly was general superintendent of the Everett Railway & Electric Company, of Everett, Wash., where he served five years. On May 9 the employees of the Everett Company presented him with a handsome diamond ring as a token of esteem. Mr. J. Reardon has been appointed to succeed Mr. Stevens at Everett. Mr. Reardon formerly was master mechanic of the company.

MR. CHARLES H. COX, manager of the Lincoln Traction Company, delivered an excellent address on May 10 about "The Art of Handling Men," before the engineering society of the Nebraska State University. Mr. Cox gave considerable attention to the proper attitude of the college graduate who enters into the employ of a large company embracing all sorts and conditions of men, and also defined some of the methods the manager of a public service corporation must use in conciliating the people and inculcating the spirit of courtesy among his employees.

SOME CHANGES have been made in the personnel of the Albany & Hudson Railroad Company. Mr. J. P. Maloney has been appointed trainmaster in charge of all trainmen and operation of all cars on the road. Mr. Chas. Eastman, as roadmaster, will have charge of repair and construction of tracks. Mr. R. P. Leavitt, as general mechanical superintendent, will have charge of car shops and mechanical work in that connection, in addition to the duties of his former position as electrical superintendent, in which he had charge of all electrical matters in connection with both the railway and lighting departments.

MR. H. J. SLIFER, recently general superintendent of the Chicago, Rock Island & Pacific Railroad, in charge of operation, motive power and maintenance between Chicago and Denver, has joined the forces of J. G. White & Company, as steam railway expert. Mr. Slifer has had a long experience in railroad work, having been connected with the Mexican National Railway, Pennsylvania Railway and Chicago & Northwestern. With the latter road he was superintendent of the Iowa division of the company. In his new connection he will have charge of matters relating to the steam railway undertakings of the White Company.

MR. SAMUEL S. HOFF, general manager of the Wilmington City Railway Company and the Wilmington City Electric Company, of Wilmington, Del., has also been appointed general manager of the Chester Traction Company. All three of these companies are controlled by the Interstate Railways Company, which also controls railway systems in Reading, Scranton and other places in Pennsylvania and also in New Jersey. Mr. Hoff is an experienced civil engineer in addition to being an experienced railway man. For eight years he was city engineer of Reading. Subsequently he entered railroading.

MR. A. B. NELSON, formerly chief engineer of the Trenton, Newhope & Lambertville Street Railway, with headquarters in Morrisville, Pa., has been appointed chief engineer of the Lancaster & Eastern Railway, with headquarters in Lancaster, Pa. The Trenton, Newhope & Lambertville Railway possesses the distinction of being the heaviest constructed electric railway in Pennsylvania, the Wilkesbarre-Hazleton, and Wilkesbarre-Scranton lines excepted. Mr. Nelson laid out the line last year, and personally supervised a part of the construction. He was also chief engineer of the Trenton Terminal Railway, and did a great deal of engineering work for the Camden & Trenton Railway.

MR. JOHN G. HONECKER has been appointed general superintendent of the New Jersey & Pennsylvania Traction Company's Trenton, Lawrenceville & Princeton Railroad, Yardly, Morrisville & Trenton, Newtown & Yardley, and Trenton, Newhope & Lambertville Street Railways, with headquarters at Trenton, N. J. He succeeds Mr. G. F. Mitchell, who goes to Allentown, Pa., with the Lehigh Valley Traction Company. Mr. Honecker was superintendent of the Trenton, Lawrenceville & Princeton Railroad during its final construction period, as well as of the Yardley, Morrisville & Trenton Railway during 1901, when the late Mr. Albert L. Johnson was living. Then he became associated with the Lehigh Valley Traction interests, in the Lehigh Valley, and remained with this company until the building of the Trenton, Newhope & Lambertville Street Railway, when he was sent to Yardly as superintendent of construction.

MR. WILLARD H. GREENE, superintendent of the Lexington & Boston Railway, met with an untimely death by drowning in the Concord River on Friday, May 12. Mr. Greene and a friend were on a fishing expedition in a canoe, when suddenly it capsized, as these things are wont to do, and both were thrown out. The accident is supposed to have happened at 3 o'clock. At 7 o'clock the canoe was found floating upside down in the river. A search was began at once for the bodies, and they were recovered at 1 o'clock the following morning. Mr. Greene was born in Milford, N. H., about 44 years ago. Early in life he entered the provision business in Lowell, later entering the employ of the Lowell Street Railway Company. From Lowell he went to Boston, where he worked for the West End Street Railway Company, leaving to accept a position at the bottom of the ladder as conductor for the Newton Street Railway Company. He rapidly made his way upward, and soon was assistant purchasing agent. Nine years later, in 1900, when the Lexington & Boston system was projected, he was sent as superintendent to oversee the construction of that road, and when the line was completed he was appointed to the position of superintendent. Assistant Superintendent Benjamin Rosson has been appointed acting superitendent of the system.

MR. W. OWEN THOMAS has opened an office as consulting electrical and mechanical engineer in Chicago. For a year past Mr. Thomas has been assistant mechanical engineer of the Chicago & Northwestern Railway. Previous to that he was electrical engineer of the great water power plant of the Michigan Lake Superior Power Company at Sault Ste. Marie, Mich. After construction work ceased, Mr. Thomas for a time had charge of all the company's electrical work, including electric light and street railway service, on the American side, and the Canadian plant supplying the pulp and steel mills with power. Early in 1904, having been at Sault Ste. Marie three years, he came to Chicago and took the position of assistant mechanical engineer with the Chicago & Northwestern Railway. He will still be connected in a consulting capacity with both companies which he has previously served. Mr. Thomas is 32 years old, and an Englishman by birth. He was educated at the Central London Foundation School and at Cambridge. His engineering experience began in England with A. Eustace Haversham, and was continued with Gurdon L. Stevenson. Eight years ago he came to this country and entered the employ of D. H. Burdham. Later he was one of Bion J. Arnold's staff, from which he went to the Soo plant. His work at the Soo especially fits him for large hydro-electric propositions, and his combined steam and electric railway experience puts him in a position to demand recognition in the electrical equipment of steam railroad suburban service.

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Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 8250 copies are printed. Total circulation for 1905, to date, 181,100 copies—an average of 8232 copies per week.

Grooved Rails Dangerous for Interurbans

The persistency with which city engineers in certain municipalities cling to the idea that the grooved rail is the only suitable rail for paved streets, and insist upon street railway companies using this type, forms one of the most embarrassing problems with which interurban managers have to contend. Many large city systems, particularly in the Central West, are laid with rails of this type, and the interurban roads desiring entrance to such cities must either adopt flanges to conform to the grooved rail in the city or take the chances of derailments while on the city tracks. In either case accidents are liable to happen.

Two glaring examples of the fact that grooved rails are dangerous for large interurban cars were furnished in Cleveland recently, when within a space of twenty-four hours two interurban cars were derailed on bridges and passengers escaped almost by miracles from being dashed to death. In both cases the cars were derailed on grooved rails which were not deep enough to admit the flanges used by the interurban companies. This type of rail was used because required by city ordinance, despite the obvious fact that a bolt from a car, or any small piece of iron or hard stone, was sufficient to derail a car, even when going at slow speed. Such rails are particularly dangerous in winter, as they are liable to fill up with ice, causing a car wheel to ride on the flange instead of on the tread, and making it almost impossible to stop quickly, as the flange will slide in the groove. We know of at least two instances where interurban managers, after suffering numerous derailments on grooved rails, reluctantly cut down their flanges in order to make it possible to operate over a short piece of track into large cities, thereby laying themselves open to accidents to cars operating at high speed on curves. In another case a manager of our acquaintance, who had suffered numerous derailments on a piece of grooved rail track laid according to the specifications of an overwise city engineer, armed a force of men with cold-chisels and hammers one dark night and cut the lip or flange from a mile or more of grooved rail, and then openly defied the city to enforce its ordinance.

Main Strength and Awkwardness in the Repair Shop

In the equipment of many street railway shops provisions for handling the heavier parts of the motors and trucks by machinery are not provided. It is possible to repair the cars without the additional expense for conveying and lifting apparatus, and those in charge feel, when building the shops, that these can be installed at a later time. Often, however, they are never installed. The heavy parts are either handled by sheer strength or probably by the employment of crude lever arrangements. In any event, the cost of doing the repair work is usually so far beyond what it would be were proper facilities provided that interest on the investment of a few cranes would be a small item compared to it.

The writer has seen all the men from one section of a shop called to assist in lifting a motor shell or heavy truck part from the floor to a push car. While the actual process of lifting would not occupy much time, the period the men were away from their work was considerable. As the piece could not be lifted until the last man had arrived, there was always time lost in waiting for him. After the work was completed, the men, being of a sociable nature, were rather loath to separate, and felt it necessary to discuss the incident. On the whole, probably from five to ten minutes would be lost. This amount from each of the ten or fifteen men makes the total time lost considerable and the cost of simply lifting the casting out of all proportion to what it would be if proper means had been provided for handling heavy parts.

But the expense is not the only item to be considered; the ability to rush a job of repairing is often more important than the cost of doing the work. It is certain that where main strength is used throughout, one cannot be certain of speedy work.

Aside from the convenience and cost to the railway company, there is a humanitarian phase to the subject and the moral effect on the men of such crude methods. Strains of one kind and another may result from the heavy lifting. Even where no real injury occurs, the body is often so strained that the man becomes sore all over and moves for the rest of the day, or possibly for two or more days, with half his accustomed alacrity, and this indirectly increases the cost of moving the heavy part. Besides this, the use of such crude time-wasting methods has a demoralizing effect on the work of the whole shop and drives away the best men. It is a well-known fact that work requiring great brute strength to a certain extent unfits men for work requiring skill and alertness. If skilled laborers stay in a shop where main strength and awkwardness are required to any great extent, it is usually under a protest, silent or otherwise, and with silent contempt for the company that will cling to such methods when better are available.

The Light Railway Problem

We have from time to time called attention to the need in this country of developing some form of light, cheap railway for use in certain districts where neither the ordinary electric road nor the steam road answers all the requirements. That interest in this subject is gradually awakening is shown by the present activity in gasoline motor car development as well as by the discussion which was aroused by the paper on "Light Electric Railways" read by J. R. Cravath before the American Institute of Electrical Engineers in Chicago on May 23. The paper was published in abstract last week, and a digest of the discussion on it appears elsewhere in this issue. As would naturally be expected, the paper brought out a variety of opinions. An analysis of the situation and the propositions advanced in this discussion will therefore not be out of place. Stated briefly, the construction proposed by the paper was for a road of 28-in. gage, with 30-lb. rails, laid on a grade which would follow the contour of the country so closely that but little expense for grading would be necessary. The motors would be single-phase, alternating current, supplied with power from existing electric light stations. To prevent cars from being top heavy on such a narrow base, a peculiar form of car body was suggested in which the center of gravity was low, while the trucks were large enough to support motors. The whole cost figured up about $8,000 a mile for the complete road.

In the discussion several alternative propositions were advanced as follows: (1) the use of standard gage, with light rails and steam or electric power, and (2) the use of the light narrow gage track proposed in the paper, and the substitution of gasoline for electric motors. Besides these propositions, there may also in this analysis be considered properly two others which did not come up in the discussion, but which are receiving some consideration, namely: (3) the use of a standard steam railroad track and gasoline motors, and (4) the use of very light standard gage track and gasoline motors.

In regard to the first proposition, it is probably true that by adding $2,000 per mile to the cost of construction, the 28-in. gage could be made standard if the same location of the road was used and if the rails were no heavier than for the narrow gage road proposed in the paper. The chief advantage claimed is the ability to exchange rolling stock with standard roads. There are several things to be considered, however, before this claim is accepted broadly. In the first place, such a cheap road, to save grading, would probably have so many curves that it would be almost as undesirable for future conversion to a standard steam or electric line as if it were narrow gage. Moreover, if very light rails are used, there would be danger of derailment to standard cars, and the bridges must be made strong enough to take steam railroad rolling stock. By the time we have added extra expense for rails, grading and bridges enough to make the operation of steam road freight cars safe, the cost of construction gets uncomfortably near that of the present cheaper class of interurban roads. In other words, we have got away from our original plan of a substitute for wagon traffic and have the heavier and more expensive construction which we wish to avoid.

The second proposition, to use a light 28-in. gage and gasoline motor cars, may be feasible where minimum first cost is of first importance. The cost of the overhead line, which is about 10 per cent, would then be wiped out as well as some of the power house investment. It would seem that of all places where a gasoline motor might be applicable, this would come the nearest to being suited to its present known capabilities. The gasoline motor and transmission gears necessary to operate cars of 5 tons or 6 tons on steam rails have already been developed and well tried in automobile work. As far as the engineering features are concerned, therefore, there would be less uncertainty about building gasoline motors for this kind of service than for any other railroad work for which they have been proposed.

The third proposition is one which is attracting considerable attention at the present time for the reason that many steam railroad companies are now looking in the direction of gasoline motors for a method of economically operating their small branch lines. As, however, the cost of the roadway is the principal item in the investment, and that of the motor power is of minor consideration, such a road can hardly be classified as a light railway. There is no hope of making it profitable unless there is enough traffic in sight to pay interest on the heavy roadway investment in addition to operating expenses. As regards the motive power, we must confess, as we have said before, that the outlook for the gasoline motor car in the heavy railroad business is still problematical. It is one thing to build a gasoline motor and transmission gear for an automobile of 3 tons or 4 tons and quite another thing to build one for a standard passenger car of 80 tons, hauling a trailer or two. As soon as the power of the engine is increased, difficulties with the transmission gear begin to crop up. Adding electric motors and storage batteries and transmitting the power from the engine to the power axle by electricity may improve mechanical conditions somewhat, but certainly involves enormous weight and complications. Then, too, as said before, the cost of fuel for a large gasoline motor car is formidable. With gasoline suited to engine use somewhere between 10 cents and 17 cents a gallon and with engines showing a factory test performance of 1 pint of gasoline per hp-hour, it does not take any very elaborate mathematics to unearth the fact that an interurban car taking from .06-hp-hour to .125 hp-hour per ton-mile is going to make a good sized drain on the gasoline tank in the course of a round trip. The field for the gasoline motor is in lighter work unless there are wonderful developments during the next few years.

The fourth proposition, to use a light standard gage track for light gasoline motors, is a compromise which has many points in its favor. It would be within the range of work easily performed by existing gasoline motors, and if rightly located could be relaid as a standard steam or electric road in a few years. Of course, it would involve more grading investment than a light narrow gage road.

It will be seen that we have in these various propositions various compromises between the lightest and cheapest construction on the one hand and standard interurban and steam road construction on the other hand. Other compromises will suggest themselves. Just which is to be selected is a matter which should be governed by the probable future of the road. One thing is evident, however, and that is, to get the lowest cost of construction by narrowing the gage and avoiding cuts and fills as far as possible, all idea must be abandoned of making the road worth much for conversion into a heavy standard gage road, except in a very level country. We may adopt some compromise which will make it of some value in the construction of a heavy standard gage road ultimately, but in doing so, the cost of construction is increased, and it may easily be so increased as to make it a losing proposition from the start.

Although it is well to look to the future in the building of any road, it is certainly a mistake to assume that all roads built are ultimately to become a part of some trunk line system. The sooner this is realized, the better. The place for the cheapest class of construction is evidently where there is no likelihood that the road will ever become part of a through system and that it will always be a feeder. There are thousands of such places. There are other places where heavy standard gage construction would some day be desirable. In such places, one of the compromises should be selected. A careful study of this whole subject brings to mind forcibly the necessity of keeping the investment at the lowest possible point and the great difficulty of steering a course which will avoid too great investment and at the same time result in a railway which will operate economically and do what is required of it.

Sunday Work in the Repair Shop

There is, of course, at times a certain amount of work in every repair shop that must be done on Sunday, or special occasions, when special orders must be rushed through to keep the road in operation. But in many shops the line between necessary and unnecessary labor on this day is very loosely drawn, with the result that much work is done on Sunday that could just as well as not be performed on any of the other six days of the week. Leaving out any moral phase of the question, it is certainly advisable to have as few men as possible at work around the shop on Sundays. There seems to be something in the mental atmosphere on Sunday that prevents a man doing a full day's work. He usually feels that the company is entitled to only six of his days a week, and that when an additional one is required, the company is imposing on his personal rights, even if he is paid full wages or a time and one-half.

But the loss is not confined to Sunday. It is impossible for a man to work day after day at the same task and in the same surroundings and retain the normal amount of vigor of mind and body. He soon becomes sluggish and never works at his highest efficiency. The custom of having men at their regular employment Sunday after Sunday tends to drive the more self-respecting and, therefore, the more valuable men away, and this fact alone is sufficient to cause serious consideration to be given to the subject.

To avoid much Sunday work in many shops, it would be necessary simply to employ a few more regular men during the week. Those men who do the work that it is impossible to do any other day would certainly give more returns for their pay if given and compelled to take for recreation one of the other days each week.

Every Eighth Day Off

A plan which has been in force in Denver for a number of years, and is also in force in a modified form in other cities, has been previously spoken of in these columns, but it is of sufficient importance to warrant our calling attention to it again. This is the plan of arranging the runs of conductors and motormen so as to give each man every eighth day off. The reason, of course, for not making the interval seven days is that it would always give certain men Sundays off. The eighth day plan rotates each man's day off so that all get the same number of Sundays off during any long period. S. W. Cantril, superintendent of the Denver City Tramway Company, who inaugurated this scheme some five years ago, is one of those who does not believe that man can do his best work if he works steadily every day, week in and week out. In fact, it is even claimed that the men average more working days per year now in Denver than they did under the old arrangement, when men got time off as they requested it, provided the company was able to grant the request. Of course, the present eighth day arrangement is modified so that on all special days all crews are subject to call for duty. On the majority of roads in this country we believe the usual arrangement is for men to be allowed days off whenever they ask it, providing it does not interfere with days of especially heavy traffic. We are strongly inclined to think, however, that the plan of having it understood that every man is to have a day off at intervals approximating once a week is beneficial both to the company and to the men. Some of the very best employees, with a desire to earn more money, will frequently go for long periods without taking a day off. Many managers consider that if a man wishes to work this way and needs the money, the company ought not to deny him the right to work every day of the year if he desires to. It may be well for the superintendent to make exceptions in favor of men who for some special reason, such as sickness in the family, may be in need of all the money they can earn, but we think that the general principle will nevertheless hold that if a regular day off is the established rule and precedent of a road, it is conducive to a steadier and higher class of service than is the older and more common plan. It will tend to get the plodder out of a rut and it will tend to steady those employees who, under present rules, take several days off at a time. Besides all these things, there is another very strong point in favor of the plan, namely, that it tends to give more work to the trippers and extra men, and partly solves the constant problem of how to provide these extra men and trippers with enough work so that good men will stay in the business. With the men on the regular runs working seven days each week, it is frequently hard for the superintendent to arrange enough work to give the extras and trippers the wages that any man in the business should get, and to provide for this some companies have even been obliged to pay some of the extras for time not actually put in, in order to bring their wages up to a living basis. Anything which tends to relieve this condition of affairs is welcome, and the eighth day scheme is one of the best helps in the solution of this problem that we know of.

THE CALCUTTA TRAMWAYS SYSTEM

On account of the more immediate interests nearer home which attracted capitalists, it was not until a few years ago that attention was directed to the possibilities of lucrative tramway undertakings in the East. Electric traction has infused new life into systems which formerly employed steam and animal traction, and the success of such conversions has been followed by numerous concessions for electric tramways in places such as Hong Kong, Singapore, Manila, Rangoon, Mandalay, Tokio, Batavia, Penang, Colombo and others. The largest and most important of the tramway systems in the East is that of Calcutta, and is of more than usual interest on account of the conditions under which it operates.

It is hardly necessary to say that Calcutta, the metropolis of India and the seat of government, is one of the largest and most important cities of the East. It is a very large port and is the center of the extensive Indian trade in tea, jute and general produce and merchandise.

On account of its low-lying position, an extensive system of artificial drainage has been adopted. This system, though fairly well carried out, is not nearly sufficient to cope with the extraordinary downpours during the rainy season, which flood the streets in certain sections of the city for the greater part of the day, sometimes to a depth of about 2 ft. and upward. Another climatic condition which causes great damage and difficulty from a traffic point of view is the number of severe wind storms, approximating to cyclones, which sweep over the city at the beginning and the close of the rainy season (which lasts from the middle of June to the end of September), often with destructive effects, uprooting trees, unroofing houses and causing general damage.

Calcutta is divided into three natural parts, viz.:

The European business district, practically confined to an area of 250 acres, located in the west central portion of the city, bordering on the eastern bank of the River Hooghly.

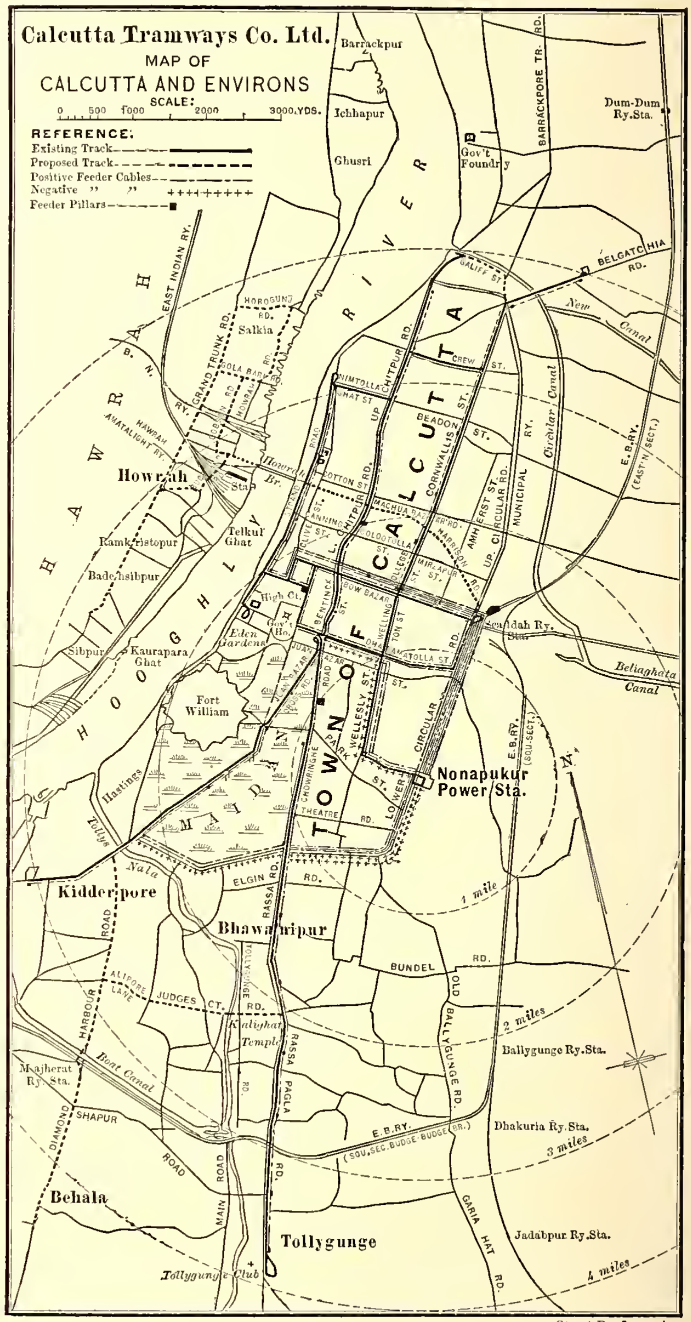
DALHOUSIE SQUARE, WEST—POSTOFFICE ON RIGHT

The native residential and business district, located in the northern part, and

The European residential district, located in the southern portion of the city.

The total population with certain adjoining suburbs is about 1,000,000, which does not include the municipality of Howrah, located on the opposite side of the Hooghly River, having a population of 157,594, nor two other suburbs which will soon come within the tramway zone, and which have an additional population of 51,806. The total population can thus be put down at 1,250,000.

In the native town the streets, as in all Oriental cities, are narrow, and lined for the most part with unprepossessing houses and huts, which are very densely peopled, one ward having a density of 281 per acre, or 180,000 per square mile. Broad roads are, however, now being cut through the native quarters, and the congested districts, which have up till lately been the hotbed of epidemics and plague, are being opened out, and this work is the beginning of a large improvement scheme upon which the government has entered.



MAP OF THE CALCUTTA TRAMWAYS SYSTEM

The southern European residential portion is traversed by wide and well-paved roads, which are lined with very commodious and roomy houses, inhabited for the most part by Europeans. The European community does not differ essentially in composition from that of other large cities of the East (where there is an almost entire absence of the European artisan). The official element is very strong, and the professions in general are well represented, while there is a larger number of European merchants. The total number of Europeans and allied races resident in Calcutta during the cold weather is approximately 14,000.

The company was registered in England on Dec. 23, 1880, and operated its system by steam trains on the Kidderpore section, and horse cars on the remaining section, until 1901, when the original concession expired. In 1899 an agreement was entered into with the city authorities of Calcutta whereby the company was granted a new concession for thirty years from Jan. 1, 1901, in consideration of the company converting the system from horse to electric traction within three years.

The capital authorized is £700,000 in £5 ordinary shares, all of which have been issued, in addition to which there is a 4½ per eent debenture issue of £350,000.

The company's head office is 1 Queen Victoria Street, London, and in Calcutta its representative is Martyn Wells, managing agent, A. J. J. Pfeiffer being assistant manager and chief engineer.

THE EQUIPMENT OF THE SYSTEM

The electrification of the system was carried out according to the most modern plans in everything as regards central station equipment, overhead and underground conducting system, rolling stock, etc., and especial attention in design was given, to adapt the plant to the peculiarities of tropical and local conditions. The engineers and contractors were Dick, Kerr & Company, Ltd., of London and Preston, for all work except the buildings and the reconstruction of the track, which was carried out by the company itself. All the rails, iron work, bonds, etc., for the permanent way work were, however, furnished by Dick, Kerr & Company. The entire conversion was creditably carried through in a comparatively short time, and the various parts of the plant have since then worked well under the most trying conditions.

It is very gratifying to note that throughout the whole period of conversion from horse to electric traction both the company's officials and the contractors received the greatest help and encouragement from the various government and local authorities.

ROUTES

As in all Oriental cities, the streets are narrow, especially in the native quarter, and as the bulk of the riding public are natives, the authorities very wisely sanctioned the laying of lines in the main native thoroughfares, although these are much narrower than ordinarily found in large cities of the West, but hardly more so than in some of the smaller old towns of Europe, especially the Continent. The Chitpore Road, which forms one of two main arteries of the native section, is probably unique as regards density of traffic, including foot passengers, carriages and carts, besides the electric cars; but even with this dense traffic the Western visitor is astonished to see how well and efficiently the tram service is kept up. Some idea may be gathered of the conditions by the view on page 970, which was taken in the morning in one of the restricted portions of this road. The tracks in all narrow streets are laid as much to the side as is possible, and the distance in many cases from the nearest rail to the curb does not exceed 2 ft. This is necessary in order to give sufficient clearance on the other side of the tracks to accommodate at least one vehicle.

A VIEW ALONG CHOWRINGHEE ROAD

VIEW AT THE INTERSECTION OF THE HONRAH BRIDGE APPROACH

As remarked above in the description of Calcutta, the entire area of the city is flat. There are no grades to speak of, except when crossing three bridges, the approaches to which do not exceed 150 yds. to 200 yds., the grades being not more than 4 per cent.

The present tramway routes, covering a total length of 23 route-miles, double track throughout, all radiate from one small section of the city, where the majority of the government offices and European business houses are located, in the west central portion bordering on the river. This small district is the objective point of thousands of natives from all directions in and about Calcutta, who have business in the courts and numerous offices. The cars on the various lines are run to either one of two termini, one being at the loop near the Hight Court (see plan); the second, the Esplanade Junction, at the intersection of Dhurrumtollah Street with Chowringee Road, the latter forming the junction between the northern and southern lines. The number of cars at these two points is, during the rush hours, very large, trains following one another in close proximity. The number of trains arriving at these points, per day, amounts on an average to:

High Court	750
Esplanade Junction	1150

The northern section of the city is served by three routes; the central portion by three, and the southern portion (including suburbs) by three, all double tracked.

A few years ago a fine large road (the Harrison Road), running east and west, was cut through from Sealdah Railway Station to the bank of the river at the Floating Bridge, which now forms the main artery of cross city traffic in the native district. A double line of track has just been laid down the center of the road and will shortly be opened for traffic.

There are eight main routes, and these, with two exceptions, can be considered city lines. The Chowringhee line runs southward to a densely populated suburb, Bhowanipore, touching upon the way the western extremity of the European residential zone. On this route is also located a famous Hindoo temple, which attracts constant native traffic throughout the year, and during certain holy festivals the service has to be doubled to cope with the rush.

A DAILY SCENE ALONG THE CHITPORE ROAD

The line to Kidderpore feeds the populated suburb which lies to the south near the river, caters to the large traffic between the extensive docks and Calcutta, and derives a large traffic from the race-meets which are held on the race course on the Maidan.

The total route mileage (all double track) at present is 24.75, with Harrison Road included. On the basis of a tributary population of approximately 800,000, the route mileage per 1000 population would be .031, as against about .08 found in England, and an average of about .25 to .30 found in the United States in cities of about one-third the population of Calcutta.

The low mileage per capita is due to the congested condition of the native quarters, which cover a much smaller area than in an equally populated Western city.

TRAFFIC

All tramways in India, which likewise holds good for the East in general, have, of course, mainly to depend upon the natives for their earnings, since Europeans form but a very small part of the population. Therefore, in investigating the possible establishment of a system, due weight must be given to their characteristics, habits, average income and occupations. In Calcutta the average income of the native workingman and laborer is not sufficient to permit him to ride freely, and in consequence he is but a small factor in the earning powers of a tramway, the main fundamental revenue being derived from the business and professional classes and government employees.

The native is a great litigant, and will spend any amount of money and time over the smallest case, and in consequence of this characteristic, the courts located in various parts of the city employ a great many clerks and other officers, and daily attract a large number of people, the major part of whom use the tramway.

Another class of rider is the clerk in the European business houses and government offices which are located in the well-defined districts already mentioned above.

Native traders do considerable business among themselves in distinct parts of the city, in what are called bazars, which afford constant interchange of traffic.

All the above constitute the steady riding factor, or regular traffic, with two "rush" points per day, on which the tramways may depend. The "floating" traffic, which is by no means small, is created mainly by the temples of the Hindoos or mosques of the Mohammedans, which constantly attract extensive crowds for worship, but which on many days, especially on those which are holy or sacred, form the objective points of many thousands of devotees from the city as well as the surrounding districts. This religious feature is a valuable asset in the earnings of all Eastern tramways, provided always that these objective points are sufficiently far removed from the center of the native population to induce them to ride rather than walk.

The first line under electric traction in Calcutta was open for regular service on March 27, 1902, and the entire system was operated electrically on Nov. 20, 1902. An exceptionally large increase of traffic immediately followed the opening of each section. This, however, was to be expected, since, under the steam and horse traction, there was only one class for passengers, and due to the severe climatic conditions of excessive heat and humidity prevalent in Calcutta during the summer months, and the consequent exhaustion of the horses, even this second-class service was not nearly sufficient to cater

JUNCTION AND LOOPS ON CHOWRINGHEE ROAD, NEAR THE GOVERNMENT HOUSE efficiently to the riding public. The total traffic revenue increase with electric traction over that of horse traction, after two years of operation, is about 75 per cent. This increase is due not only to more accommodation furnished in the shape of extra car mileage for the second-class passengers, but because the motor cars which serve the first-class developed an altogether new source of revenue, since people are now riding who in past years never made use of the tramway. This is especially the case with Europeans and the better class of natives.

CAR SERVICE AND SPEEDS

The car service, or rather train service, regulated carefully according to requirements, begins at 5 a. m. and ends at 10:30 p. m. The native being an early riser, traffic begins quite briskly in the morning, takes a sudden rise at 9:30 to 11 a. m. during the office traffic, falls off during the afternoon, increases rapidly again at 4:30 for the return office traffic, and is practically finished at 9:30 in the evening, since the native travels about but very little at night.

The maximum number of trains operated at one time during an ordinary week day, on the present 46 miles of single track, is 132. This is increased to 145 on race days, and during the recent Pujah festival of the Hindus (corresponding to our Christmas in importance), the then full equipment of 151 trains was required. During this time the traffic to the temple at Kalighat, from all parts of the city, was very large.

Although there are well recognized fixed stopping places on the system, it has not been found practicable to make use of them exclusively, on account of the very severe conditions of heat and rain, which make it necessary for the comfort of passengers to set them down and pick them up wherever they may require.

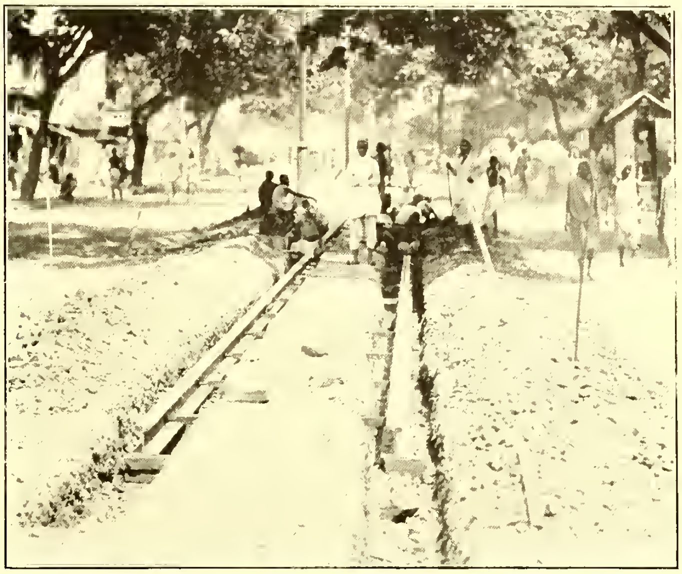
STAFF

The employees are all native with the exception of the superintendent and his two first assistants, who are Europeans. A considerable number of the employees were inherited from the old horse car days, and in consequence had the experience which made their initiation into electrical traction comparatively easy. Drivers of old horse cars were taken on to act as motormen, and right from the start acquitted themselves admirably. It is really astonishing to note with what skill and coolness they handle a heavy train in the narrow streets full of people and vehicular traffic and native conveyances. Conductors are checked and supervised very carefully by a comparatively large staff of checkers and inspectors, who are promoted from the ranks of conductors.

STATISTICS

A few traffic results are herewith given which might be of interest to show how they compare with those found in the West:

Total number of passengers carried per year	21,000,000
Total yearly train miles run	3,300,000
Passengers per train-mile	6.4



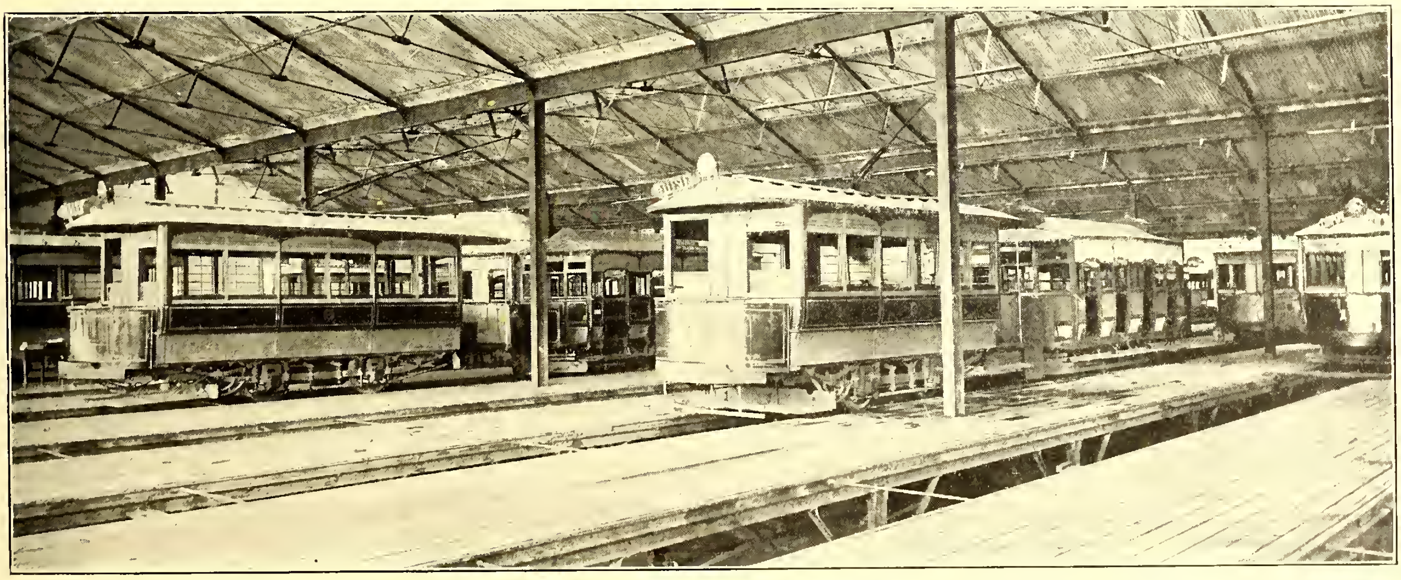
CONSTRUCTING THE ROADBED FOR THE LATEST EXTENSION

Average distance traveled, per passenger (miles)	2 to 2¾
Average fare per passenger (cents)	2.92
Traffic operating expense per train-mile (cents)	2.5

The traffic operating expenses per train-mile, given above as 2.5 cents, includes salaries and expenses for the superintendent, assistants, motormen and conductors, inspectors, starters, cashiers, etc.

TRACK CONSTRUCTION

A considerable portion of the track in the early days of the company was single, with turn-outs. This was found to be very unsatisfactory, especially in an Eastern city where an accurate schedule timing, such as is required to give a satisfactory service with single track and turn-outs, was practically impossible. The track was gradually doubled throughout, the last line being the Kidderpur section, just before the introduction of electric traction.



VIEW OF THE INTERIOR OF THE NORRAPUKUR CAR HOUSE

Some of the reconstruction was started as far back as 1892, but the bulk of it was completed three or four years ago. The gage of the track is the standard 4 ft. 8½ ins. Girder rail was substituted for the old box rail throughout, the rail on some of the sections which were first reconstructed being 95 lbs. per yard, with ¾-in. and ⅞-in. groove, but all the later types, and those which are now being used on extension work, consist of a 101-lb. rail, with a 1⅛-in. groove.

In spite of the heavy traffic to which some of the lines are subject, the track has stood up well, and where it has given way it has probably been due to the sinking of the sub-soil. The usual tie-rod construction is employed, five rods being provided on an average per rail length of 30 ft., each rod weighing 15¼ lbs., including check-nuts and bolts.

The rail is embedded on a lime concrete stringer having a width of 16 ins. and a depth of 9 ins. This concrete is made up of 10 parts broken brick, 3 parts of ground brick and 2 parts of slaked lime. The above method of making up concrete is prevalent in Calcutta, since broken stone is expensive, as is likewise good sharp sand, and the high price of Portland cement prohibits its use in this connection. The lime concrete with the above composition and material makes a very good substitute for the ordinary cement concrete, though more care is required to consolidate it and a greater time is necessary to enable it to set properly.

The edges of the rails on all lines in the city are paved to a width of 18 ins. on the outside of the double-track rails and 9 ins. on the inside, Indian granite blocks being used. In some streets and parts of streets where the track is especially heavy, paving is carried straight across the double track to a width of 18 ins. on the outside of the extreme rails. The setts are embedded in sand and grouted with 4 parts of river sand and 1 part of Portland cement.

In its agreement with the city, the company undertakes to keep the roadway in proper repair to within 18 ins. on the outside of the extreme rails.

Two No. 0000 B. & S. Neptune bonds are used for every joint, the bonds spanning the fish-plate and having a length of 2 ft. 6 ins. The track is adequately cross-bonded.

OVERHEAD LINES AND FEEDERS

The system is worked throughout by means of the overhead trolley, and on account of the peculiar conditions existing, a part of the lines had to be equipped for the side-running type. Of the 23 miles of route,

20 per cent is center pole construction.
30 per cent is side bracket construction.
50 per cent is span wire construction.

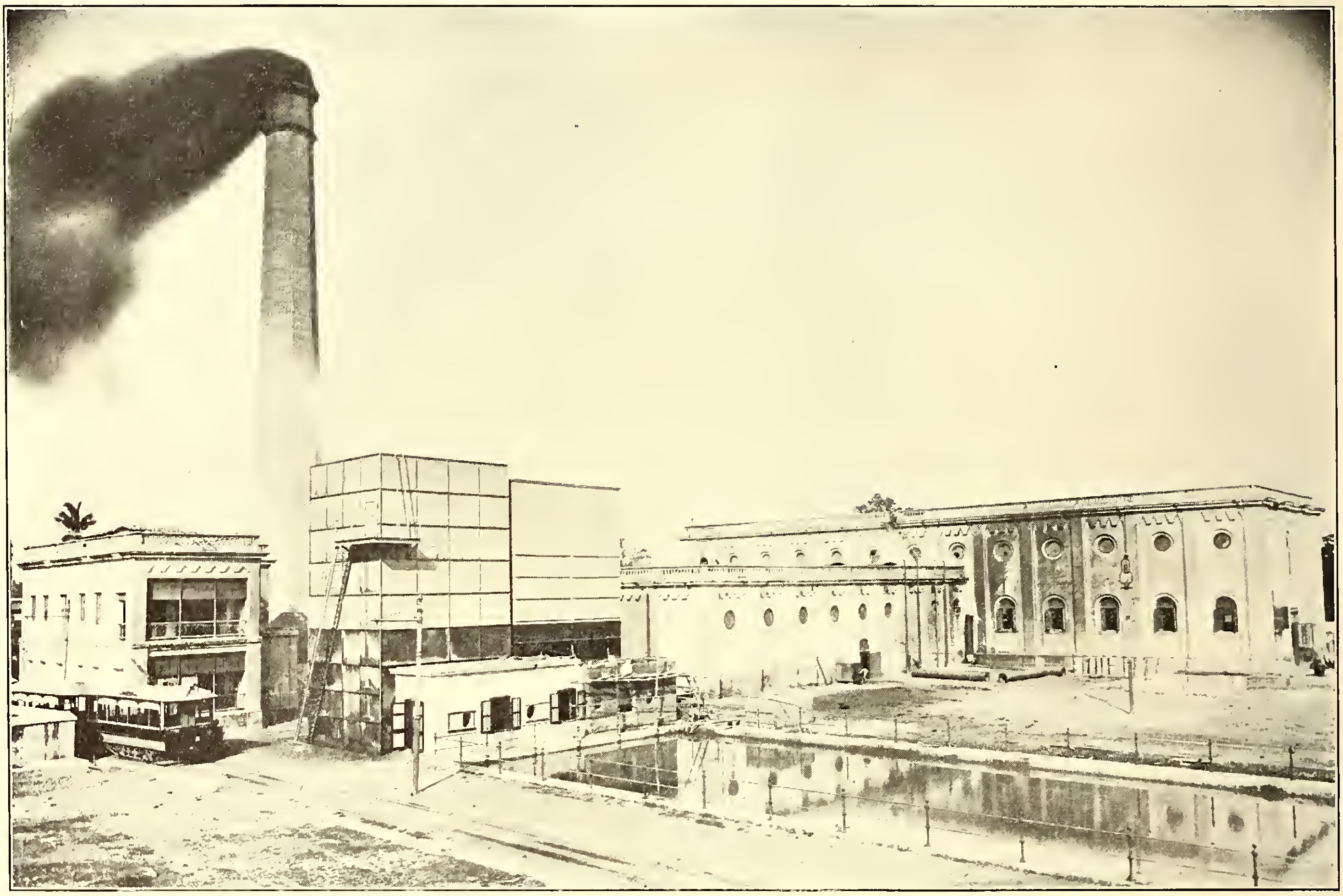
The poles used are made up of steel tubes varying in thickness and weight according to the requirements of their location. Each is built up of three sections, socketed into each other, giving the general appearance of a gradual taper. The average distance between the poles varies from 100 ft. to 120 ft. on the straight. The weights are as follows:

	Weight	Dimensions
Light poles	673 lbs.	27 ft. 6 ins.
Heavy poles	1032 "	27 " 6 "

The brackets used on the side-running portions vary in length from 3 ft. for a center pole to 15 ft. for side-pole construction, the internal diameter of the tubes being 2 ins.

The trolley wire is of hard-drawn copper of No. 000 S. W. G. gage, and is generally supported by double insulating hangers of the rigid suspension type, but flexible suspension has been substituted for these on that section of the Chowringhee lines where the speed attained is greater than the average, so as to lessen the effect of the blow on the ears. A similar improvement will be made on the Kidderpur line.

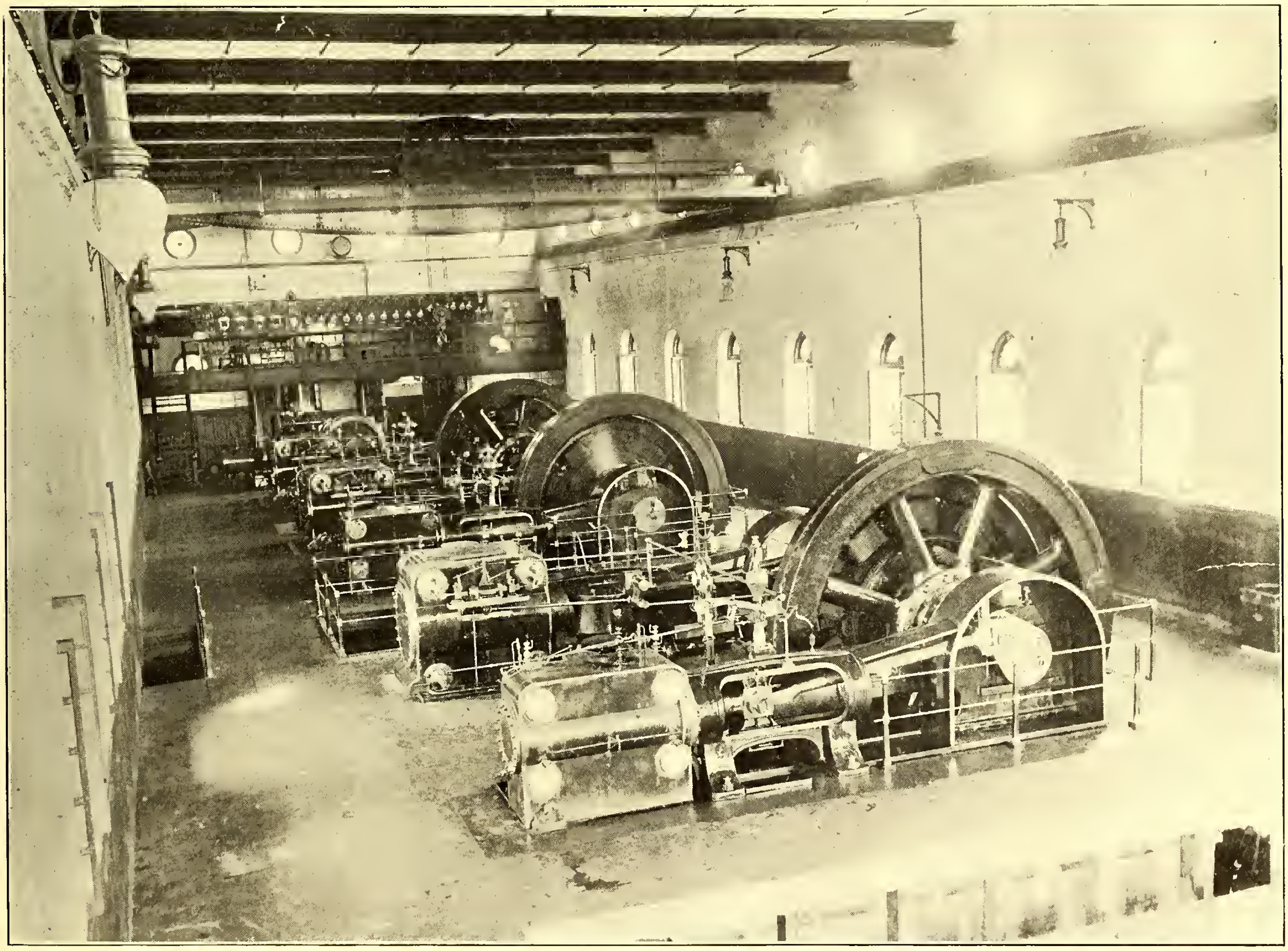
The angle of the trolley pole varies considerably on the dif-



THE NORRAPUKUR POWER STATION OF THE CALCUTTA TRAMWAYS ferent side-running sections, the maximum outreach, which is on the Chowringhee line, being 4 ft.

The arrangement of the feeders, both positive and negative, is shown in the map on page 968, from which it can be seen that the majority of the feeding cables are led to the central point of the city, where all lines converge. There are nine positive feeder cables, varying in cross section from .19 sq. in. to .6215 sq. in., which emanate from the power house and are connected to forty-three feeder and section pillars distributed over the various routes. The return or negative cables are three in number, one of them having a cross section of .7942 sq. in., and the other two .3 sq. in. each.

All cables are paper-insulated and protected by heavy lead sheaths, and were laid underground in cast-iron troughs on the solid system, the troughs as a rule being located along the outside margin of the tramway right of way. The cables are supported in the troughs by wooden bridges, and the whole trough is filled in with a special pitch compound. The troughs themselves are laid in a trench varying from 16 ins. to 24 ins. in depth, according to the nature of the ground. This system of laying has given rise to difficulties due to the cast-iron covers of the troughs being too thin and easily pierced by the picks of excavators. Several burn-outs of cables have been traced to this cause, and to obviate and eliminate this danger as much as possible in all future cable laying, earthenware troughs are now being used. This trough has a cover 1¼ ins. thick, and it has been found that this thickness will withstand ordinary negligence in the digging up of the roadway. In order to forestall any difficulties which might arise, due to the sinking of the infirm soil, these earthenware troughs, especially in cases when they will carry high-tension cables in connection with the plant extensions, are embedded on a concrete stringer 6 ins. thick. The cables used for connecting from the feeder pillars to the trolley wires are 61/17 S. W. G. rubber insulated, heavily braided and lead covered. The feeder pillars themselves are made up of a cast-iron box which is raised 2 ft. from the ground in those places where there is danger of the pillar being flooded, due to the rains. Each pillar contains the usual standard switches and connections mounted on a marble or slate switchboard.



A VIEW OF THE GENERATING UNITS AND SWITCHBOARD IN THE NORRAPUKUR POWER STATION

ROLLING STOCK

When converting from horse to electric traction, it was decided to adopt the train system, consisting of one motor and one trailer car, the former serving first-class passengers, represented by Europeans and well-to-do natives, who previously never made use of the tramways, and the latter providing accommodation for the old patrons. This system made it necessary to construct loops or triangles at various points of the lines for the turning of the trains.

At present there are 171 single-deck motor cars, of which 96 are of the open type and 75 of the closed type. The motor equipments were made at the Preston works of Dick, Kerr & Company, Ltd. The car bodies were supplied by the Electric Tramway & Railway Carriage Works, Preston, and the trucks were furnished by J. G. Brill & Company.

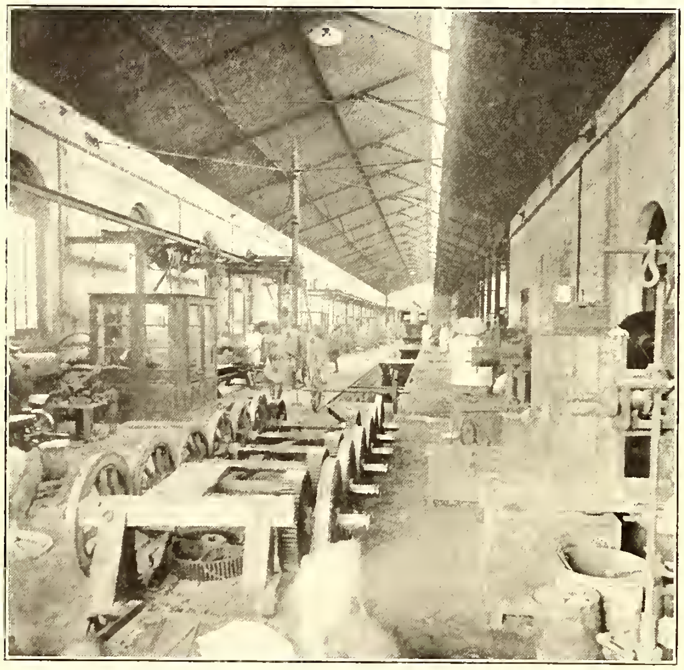
The car bodies are of plain, strong construction, made to suit the climatic conditions. Teak wood is used throughout, as being impervious to the ravages of white ants. The closed cars have a total seating capacity of twenty-seven.

The open type cars, which have a seating capacity of forty passengers, are single-ended, with the entrance from one side only, this being dictated by the loop system that was adopted.

The electrical equipment for each car, as manufactured by Dick, Kerr & Company, consists of two motors, with one controller and all accessories. Each motor has a normal output of 25 hp under the standard rating. It might be pointed out that the motors have had to stand very severe operating conditions, due to the heavy rains, which, during the rainy season, flood certain parts of the city to a depth of several feet, as already mentioned above. Heavy showers come on so rapidly that the drainage system is incapable of satisfactorily coping with excess of water, which makes it difficult at times to get the cars out of the low-lying districts, which flood in remarkable short space of time.

POWER STATION

The situation of the power station with respect to the tramway system can be seen from the map. The building is a brick structure, covered on the outside and inside with sand plaster, the usual form of building construction prevalent in India. The chimney is of brick, and has a height of 150 ft.; inside



PART OF THE NORRAPUKUR MACHINE SHOP OF THE CALCUTTA TRAMWAYS

diameter at top, 7 ft. 6 ins., and the base of the chimney is 36 ft. square.

ENGINE ROOM

The equipment of the engine room at present consists of three units of the same design, in addition to which there is a supplementary unit of smaller capacity, suitable for supplying current during the hours when the traffic is light, and likewise in working in conjunction with two of the large units to carry the maximum load in the station, thus leaving one large unit in reserve.

The three large engines are of the horizontal cross-compound condensing type, with generator and fly-wheel located between the high and low-pressure sides of the engine. They are of the Yates & Thom type, and run at 90 r. p. m., with a working pressure of 120 lbs. per square inch, and under these conditions the engines develop at their most economical operating point about 675 ihp. They are, however, capable of working satisfactory up to 950 ihp, representing 25 per cent overload. The cylinders are 21 ins. and 40 ins. in diameter, with a stroke of 3 ft. 6 ins. The valve gear for working the admission valves is a well-tried release or trip gear of the improved "Dobson" type, consisting of hardened steel catch plates attached to blocks which are connected by links to the steam valve levers, and has also spindles or rams coupled to the dashpot pistons.

The governor is of the quick-speed type, with center weight and cross-arms, designed so as to give the necessary sensitiveness, combined with ample power to overcome the resistance of the tripper gear. A sensitive knock-off appliance is fitted to the governor, arranged to disconnect the trippers and hold them in such a position as to prevent steam being admitted to the cylinders, in case the engine should attain an excessive speed or an accident happen to the governing gear.

The fly-wheel is about 16½ ft. in diameter, constructed in sections, and has a weight of about 29 tons.

The smaller engine is of the Robb-Armstrong automatic cut-off manufacture, tandem-compound side-crank type. The indicated horse-power is 250, with 135 lbs. initial pressure when cutting off at about one-third stroke in the high-pressure cylinder at 200 r. p. m.

Each of the generators constituting part of the main unit is a 500-kw Dick-Kerr d. c. railway generator, with an efficiency for each generator of about 95 per cent full load and about 93¾ per cent half load. The generator which is coupled to the smaller engine unit has a capacity of 150 kw, and is direct coupled to the engine, the general arrangement and mechanical and electrical features of this machine being practically the same as those for the larger units already described.

The switchboard is of the panel type, constructed of enameled slate and supported by an iron framework, the whole placed on a gallery at one end of the engine room and overlooking it. The board consists of four generator panels, one main output panel, ten feeder panels, one lighting panel, one motor panel, three negative booster panels and one Board of Trade panel. For assisting the rail-return distribution so as to comply with the regulations, which are that no part of the track return should show a greater drop than 7 volts, three boosters have been installed, connected to the track by insulated return cables. These boosters have a respective capacity of 800 amps. at 80 volts, 300 amps. at 120 volts and 300 amps. at 70 volts.

The engine room is spanned with the usual overhead crane, designed to lift 15 tons, the manipulation being accomplished by hand.

BOILER ROOM

There are at present in the boiler room six boilers, all of which are of the Galloway (Lancashire) type, 30 ft. x 8 ft. in diameter, the interior consisting of two furnaces joined into one Galloway flue. The furnaces are 3 ft. 3 ins. in diameter, solid welded longitudinally and flanged transversely. To the present plant has just been added one B. & W. boiler, which will not only help out the present installation, but will form part of the large extensions to the entire plant, which will be touched upon below.

The boiler feed-pumps consist of three Weir's patent direct-acting feed-pumps, each having ample capacity to supply water for four of the boilers, thus leaving one in reserve for the present nominal output of the power house. The pumps are 7 ins. in diameter by 9½-in. steam cylinder, and have a stroke of 18 ins. Each pump is capable of delivering 30,000 lbs. of water per hour.

Ample coal storage is provided by bunkers immediately opposite the boiler fronts, it being possible to store sufficient coal to operate the plant for four weeks.

In connection with the boiler plant, a Green's economizer, consisting of 480 tubes, is provided.

CONDENSER

The condensing plant is located in the basement of the engine room, and consists of a surface condenser of sufficient capacity to deal with the exhaust from all three main engines, together with two steam-driven air pumps (each having a capacity of two units), and two electrically-driven centrifugal circulating pumps, each pump being capable of discharging 72,000 gals. of water per hour through the condensers and up to the water inlet on the cooling towers. The pumps are mounted on a self-contained bed-plate with a 35-hp motor coupled direct. This plant, in conjunction with the cooling towers specified below, is calculated for condensing 36,000 lbs. of exhaust steam per hour. When this amount of steam is being condensed, and the pumps are working at full speed, a vacuum of about 21 ins. to 22 ins. is obtained in the condenser during the cold season, when the atmosphere is dry. During the rains, however, the humidity in the atmosphere is large, and in consequence the efficiency of the cooling towers is very much reduced, making it possible to attain a vacuum of only 18 ins. to 19 ins. with maximum load in the station.

At present there are two towers with fan draft installed for the purpose of cooling the water from the condensers, one being of Klein's patent type, the other, which was recently installed, being of the Zschocke type. Both are rectangular towers, 23 ft. x 20 ft. x 40 ft. high, divided into two sections.

CAR HOUSES AND REPAIR SHOPS

Four car houses, located at various extremities of the system, have been provided to house the present rolling stock. The principal shed is that at Nonapookur, located on the same premises as the power station. Adjoining the sheds are the work shops, smithy, foundry, paint and woodworking shops, armature winding department, etc., and it is here that all extensive repairs to car bodies, trucks and equipments are carried out. The other three sheds attend to small repairs to controllers, lights and miscellaneous equipments.

PROPOSED EXTENSIONS

To provide sufficient power for additional trains which will have to be run to cope with the steadily increasing traffic demands on the existing lines, and also for the service on Harrison Road and several new suburban lines which will be opened in the near future, the power station is being considerably increased. Three-phase alternating-current generators are being installed, generating 6600 volts direct, and the current will be transmitted to several rotary converter sub-stations in outlying parts of the city by means of duplicate three-core cables laid separately on the solid system in earthenware troughing. These extensions to the plant will form the subject of a future article.

The summer schedules of the Brooklyn Rapid Transit Company went into effect Saturday, May 6. All of the lines that run to the beaches were put into operation on the date mentioned, and the schedule on the lines that run to the shore the year around was increased. The following surface lines run to Coney Island: Third Avenue, Court Street, Vanderbilt Avenue, Fifteenth Street, Reid Avenue, Tompkins-Lorimer and Union Street. The motor trains to Coney Island are the West End, the Sea Beach and the Brighton Beach lines. The service on the latter has been increased so that trains run on a headway of fifteen minutes. The Sea Beach expresses run from Park Row to Coney Island every twenty minutes a greater part of the day and evening. Special schedules are arranged for Saturdays and holidays.

SPRINKLER TEST IN CLEVELAND

An interesting test on the value of automatic sprinklers was conducted April 24 at the Miles Avenue car house of the Cleveland Electric Railway Company, under the auspices of the Cleveland Electric Railway Company and the National Fire Protection Association. The car house is 96 ft. x 456 ft., and is constructed of 12-in. brick walls between brick pilasters, which are spaced 16 ft. center to center. There are large windows between the pilasters and one large door at the north end, while the south end is entirely open. The roof is of gravel and composition, on wood sheathing, and about half of it is supported by wooden trestles. The rest of the roof is supported by wooden posts spaced 16 ft. center to center in three rows. The car house has a capacity for eighty cars.

The car house was equipped throughout with the Grinnell dry-pipe system and automatic sprinkling heads. In addition to a regular ceiling equipment there was one line of sprinklers over each aisle between tracks and between tracks and side walls. The height of these aisle line sprinklers averaged 8 ft. 10 ins., or about 4 ins. below the top of glass in car windows,

INTERIOR OF CAR HOUSE FROM SOUTH END, SHOWING SIDE AND ROOF SPRINKLERS

except the lines on either side of car used in test No. 4. The aisle sprinklers were spaced 6 ft. apart, not counting the repair shop, offices and club rooms. There are 484 ceiling and 704 aisle sprinklers exposed to one fire. There are eight 6-in. dry-pipe systems with Grinnell air and alarm valves. The greatest number of sprinklers on any one system was 201.

The water supply was from both city mains and gravity tanks. The latter consisted of two 35,000-gal. tanks on steel towers, on which the bottoms of the tanks were 78 ft. above the ground. The tanks themselves measured 18 ft. x 20 ft.

Five tests were conducted, as follows:

Test No. 1, on Car 193.—Ceiling sprinklers only operated.
Test No. 2, on Car 194.—Ceiling sprinklers only operated.
Test No. 3, on Car 112.—Ceiling sprinklers only operated.
Test No. 4, on Car 222.—Aisle sprinklers at transom level only were operated.
Test No. 5, on Car 189.—Aisle sprinklers at window level only were operative; metal hoods and board shields were used.

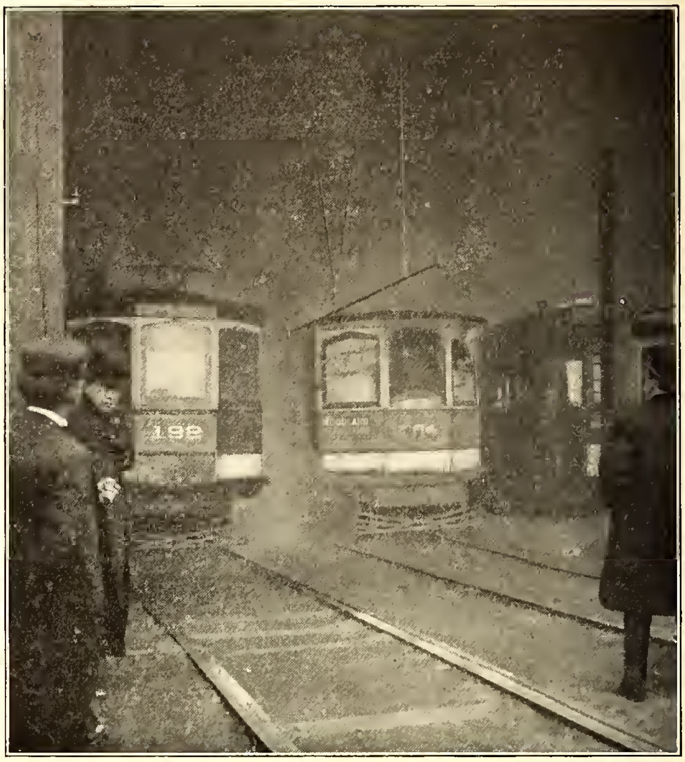
The following is a summary of the tests:

In fire No. 1, which was conducted to determine the value of under-ceiling sprinkler protection only, the car burned (No. 193) was located about 55 ft. from the south entrance of the building, with four others exposing it as follows: One adjoining on the same track, two to the west, 12 ins. and 19 ins. from the side of the car, and one to the east, 6 ft. distant. One row of aisle sprinklers was between the second named exposure, and two rows of aisle sprinklers between the last named exposure. Light combustibles and kerosene were used as fuel within the car. All openings, except the front and rear, were closed. The fire soon gained great headway and opened the ceiling sprinklers, but before any quenching effect was determined, the aisle lines were turned on. The effect of the latter was almost instantaneous in controlling the fire. The ceiling sprinklers were not given a severe test in this fire, although fourteen heads opened just prior to the turning into service of the aisle sprinklers. The fire did not communicate to other cars or to the building. The aisle sprinklers, when turned on, performed excellent and effective service and reached the heart of the fire. About 25 per cent of the combustible material of the car body was consumed.

DURING FIRST FIRE, FLAMES BREAKING OUT OF CAR SIDES AND REAR END

Fire No. 2, like fire No. 1, was conducted to determine under-ceiling sprinkler protection only. The car burned (No. 194) was located about 25 ft. from the south entrance of the building, with three other cars exposing it as follows: One adjoining on the same track, one to the west, 18 ins. from car side, and one to east, 6 ft. from car side. The arrangement of aisle sprinklers was the same as in fire No. 1, and light combustibles were used as fuel. The end windows and doors were open. The fire gained great headway, opening the ceiling sprinklers, which held the fire in check, but did little toward extinguishing the fire inside of the car. The fire burned itself out, with about 85 per cent of the combustible material of the car body consumed. The car on the westerly exposure was damaged to a serious extent by scorching of the interior veneering and the outer exposed surface. Two windows in this exposed car were knocked out by hand during the early progress of the fire. A wood post 14 ins. east of the car was slightly blistered, and the roof boards and rafters also were slightly scorched. Forty ceiling sprinklers opened and held the fire in check to one car, with damage to other features as described.

Fire No. 3 was also to determine under-ceiling sprinkler protection only. The car burned (No. 192) was located about 112 ft. from the south entrance of the building, with three other cars exposing, their arrangement about identical with that of fire No. 2. Light combustibles were used as fuel. The fire was severe and flames poured out of all sides and rear openings, opening twenty-nine ceiling sprinklers, which checked the fire and confined it to one car, with slight damage to the exposed post and cars No. 222 and No. 189. The ceiling sprinklers to open were confined comparatively to a more compact area than in any other test. This demonstration was successful under the favorable conditions offered. About 80 per cent of the combustible material of the car was consumed.



STARTING OF SECOND FIRE, SHOWING WINDOW BROKEN TO CREATE DRAFT

DURING FIFTH AND LAST FIRE, TAKEN AFTER REKINDLING OF FIRE AFTER IT HAD BEEN CONTROLLED BY ONE AISLE SPRINKLER

Fire No. 4 was conducted to determine the value of under-aisle sprinkler protection only, at the transom level. The car burned (No. 222) was located about 55 ft. from the south entrance of the building and at the southwest corner of the building, with three of the cars exposed, arranged similar to those of fires No. 2 and 3, except that the distance on either side to the adjacent cars averaged 20 ins. to 21 ins. There was one line of sprinklers only in each aisle, placed at a level with the transoms and 32 ins. from them. Light combustibles and kerosene were used as fuel; the end windows and doors were left open. Five aisle sprinklers opened and controlled the fire, without communication or damage to any of the adjoining cars, roof or building parts. Prompt and effective interior service from aisle sprinklers was illustrated in this fire, although the aisle sprinklers were at a disadvantageous location from a point of quantity distribution into the car. This experiment was successful, in that the fire did not communicate to other property, and was controlled with about 20 per cent or less of combustible material of the car body consumed.

Fire No. 5 was held to determine the value of under-aisle sprinkler protection only, opposite the car windows. The car burned (No. 189) was located about 80 ft. from the south entrance of the building. The arrangement of cars was about the same as in fires No. 2 and 3. Several transom lights were broken and the end doors and windows open. A metal-clad board 9 ins. wide was placed over the aisle sprinkler line on the west side of the cars, at a height of 10 ins. above the sprinkler line. The regular sprinklers in the aisle lines, on the east side of the car, were replaced by sprinklers having a metal hood 4 ins. in diameter, placed 2 ins. above the regular deflector. The function of these hoods and board was to bank the heat, and thus act as heat accumulators, and thus to make the aisle sprinklers respond more quickly. The fire was started under the same conditions used in the other tests. One sprinkler opened promptly near the southwest corner of the car, and so effectually quenched the fire that it was decided to replace the sprinkler and rekindle the fire. After doing this the water was again turned on, and the sprinkler just put in was opened and again held the fire in check. Two heads on the line on the east side of the car were opened by hand, in order to determine to what extent, if any, the hood might interfere or assist in the water distribution, also to what extent they might act as an individual shield to the fuse, from other sprinkler sprays. The fire experiment was successful in that the fire did not communicate to the ceiling or adjoining cars, and illustrated the excellent and effective interior distribution from aisle sprinklers when placed opposite the windows. About 25 per cent of the combustible material of the car was consumed, but had not the fire been rekindled the combustible material burned would have been less than 10 per cent.

THE BURNED CARS AFTER THE FIRE

SUMMARY OF SPRINKLER TESTS, APRIL 24, AT MILLS AVENUE CAR HOUSE, CLEVELAND

	OPERATING DETAILS.	Fire No. 1.	Fire No. 2.	Fire No. 3.	Fire No. 4.	Fire No. 5.	REMARKS.
1	Water supplies on systems	City and tanks	City and tanks	City and tanks	City and tanks	City and tanks	Tank service only used.
2	City pressure at base of risers, (static)	18 lbs.	18 lbs.	18 lbs.	18 lbs.	18 lbs.	Average city pressure, 18 lbs.
3	Tank pressure at base of risers, (static)	40 lbs.	40 lbs.	39— lbs.	39 lbs.	38— lbs.	Average tank pressure, 39— lbs.
4	Running pressure at highest line of sprinklers	28 lbs.	28 lbs.	27 lbs.	27 lbs.	26 lbs.	Average running pressure at highest line of sprinklers, 27.2 lbs.
5	Air pressure on systems	20 lbs.	16 lbs.	18 lbs.	14 lbs.	Wet	Fifth fire given under wet systems.
6	Time fire was started	10:12 a.m.	11:12 a.m.	1:10 p.m.	2:19½ p.m.	3:11 p.m.	All fires started under similar conditions inside of cars; kindling, paper and kerosene used.
7	Time first valve tripped	10:21 a.m.	11:16 a.m.	1:13½ p.m.	2:21½ p.m.	3:13 p.m.†	Air and alarm systems worked promptly.
8	Time water turned on aisle systems	10:22½ a.m.	X	1:20½ p.m.	In use	In use	In first fire aisle sprinklers were turned into service, otherwise more ceiling sprinklers would have opened.
9	Time water turned on ceiling systems	In use	In use	In use	X	X	Not turned into use, not required.
10	Time water shut off	10:23½ a.m.	11:27 a.m.	1:22 p.m.	2:30 p.m.	3:18 p.m.	In fifth fire water could have been shut off four minutes earlier with fire under control.
11	Time sprinklers were operating	2 min.	11 min.	8½ min.	8½ min.	5 min.	An approximate average of seven minutes per fire.
12	Number of systems involved	2	2	4	2	1	In No. 3 fire, car was near dividing line of four systems.
13	Number of heads opened and delivered water	14 ceil, 5 aisle	40 ceiling	29 ceiling	5 aisle	1 aisle	Average under ceiling service 28; under aisle 3.
14	Number of heads opened without water supply	5 aisle	8 aisle	7 aisle	21 ceiling	10 ceiling	Water turned on aisle systems in first fire one and one-half minutes after valve tripped and almost instantly controlled fire.
15	Total number of heads opened	19	48	36	26	11	Total number of heads opened in all fires 140.
16	Number of gallons of water delivered during tests	X	X	X	X	X	Total 13,500 gallons, a drop of 36 inches in tanks.
17	Systems to open first	Aisle	Aisle	Aisle	Aisle	Aisle	Showing that aisle sprinklers were promptly reached by heat.
18	Horizontal distance from fire to remotest sprinklers to open	28 ft. ceil.	46 ft. ceil.	36 ft. ceil.	34 ft. ceil.	21 ft. ceil.	Heat tendency directed toward highest center of roof.
19	Number of cars exposed from 1 to 6 ft. distance	4	3	3	3	3	Arrangements very similar in each fire.
20	Number of cars damaged	1 (No. 193)	3 (Nos. 194, 222, 192)	3 (Nos. 192, 189, 222)	1 (No. 222)	1 (No. 189)	In fire No. 1 aisle lines prevented damage to cars No. 192 and No. 222.
21	Slight damage to building	None	Rf. & Psts.	Rf. & Psts.	None	None	Slight scorching of posts and roof in Fires Nos. 2 and 3 only.
22	Draughts: Day very calm, no breeze	None	None	None	None	None	Draught was not obtainable but was necessary to render test of an extreme order.
23	Dimensions over all of cars fired, (height 11 ft. 5 in.)	8x30 ft.	8x30 ft.	8x30 ft.	8x28 ft.	8x30 ft.	All box cars with front vestibule and open rear flat top roof platform.

† Heads opened. NOTE—Data obtained by eight men detailed to take readings and time. Watches all set to one time.

A NEW STORAGE YARD AND SHOP PLANT FOR THE BROOKLYN RAPID TRANSIT COMPANY

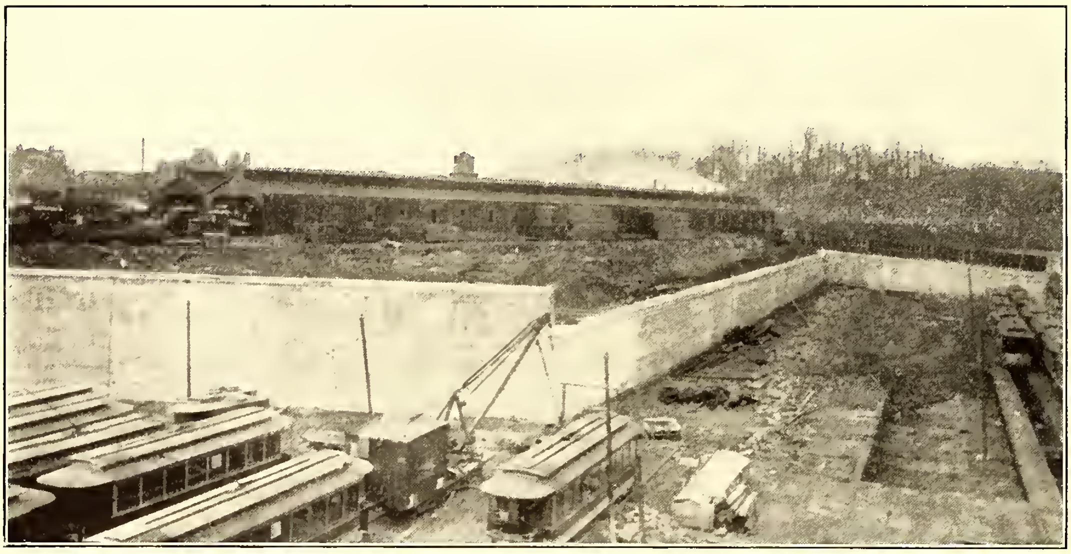
The installation of a storage yard with a combined capacity of 318 elevated cars and 327 surface cars is something of an anomaly for an electric railway system, few, if any, of so great a size having been built for this class of service. Problems of great magnitude are involved, not only in the construction, but also in the equipment for operation and maintenance afterward of such a plant, all of which are of particular interest in view of future development. Such a yard is under construction by the Brooklyn Rapid Transit Company, upon the site of its present eastern division shops, for the accommodation of the elevated and surface lines of the eastern district of the city. The design of this yard and shops has presented to the company one of the most serious problems that it has yet had to deal with, and the selection of the arrangement shown is significant of an important achievement in electric railway operation in many ways.

The site to be occupied by the new yard and shops is and has been for some time occupied by the old elevated storage yard and shops of the eastern division of the elevated system, this site at Broadway and Fulton Street having been secured at the time of the construction of the Broadway elevated line. Only a part of the property has heretofore been used for yard and shop purposes, however, portions having been devoted to auxiliary purposes, such as for the building department of the company, etc. It is now, however, intended to devote the entire property to the combined requirements of the surface and elevated storage yard and elevated shop plant, as indicated in the accompanying ground plan.

The character of the installation was determined very largely by the original contour of the ground. It seemed desirable to hold to the usual practice of maintaining the elevated storage yards at the level of the elevated railway tracks, and the surface yard at the street level; this condition was fortunately favored by the natural contour of the plot of ground which rises rapidly toward the rear or the Bushwick Avenue side, the difference in level between the Fulton Street corner and the rear of the property amounting to 27½ ft. This was taken advantage of by building a large retaining wall approximately through the middle of the property and filling in at the rear, so that the entire rear portion of the property is on a level with the elevated structure tracks, while the greater part of the lot adjacent to the Broadway side remains at street level; a large portion of the surface yard at the rear, near the retaining wall, needed to be excavated for this purpose, but this was seen to be available for filling in at the rear for the higher level yard.

Accordingly the retaining wall was built from near the western end of the property eastward and parallel to the Broadway property line, as shown; just east of the elevated structure connection the wall swings to the north and then continues toward Bushwick Avenue, parallel to Gillen Place. The entire area at the rear of the wall is filled in, bringing the difference in level between the two yards up to from 18 ft. to 24 ft. The lower area in front of the wall is kept as near as possible to that of the street level, although the western end of the surface yard is some 6 ft. or 8 ft. higher than the entrance point at Fulton Street, which is not objectionable, however, inasmuch as the length of this surface yard is over 1000 ft. The surface and elevated yards are easily distinguished in the layout plan of the yard in that the elevated tracks are indicated in full lines, while the surface yard tracks are shown in dotted lines.

The construction of the retaining wall was a problem of considerable magnitude. Concrete construction was decided upon and walls of great stability were built in all cases. The general details of the type of wall used is shown in an accompanying detail drawing; the left-hand wall detail is the type of retaining wall which was built through the middle of the property parallel to and 175 ft. back from the Broadway property line. This portion of the wall alone is 675 ft. long. At the rear of the storehouse and stock room the type of wall used is that shown in the middle wall detail, this portion being over 160 ft. in length. The portion of the retaining wall between the inspection pits for the elevated division and the repair shop on the Gillen Place side of the property is made use of as a division wall in the shop building, as will be referred to later in a description of the shop installation. Further retaining wall construction was found necessary at the Bushwick Avenue and Gillen Place corner of the property; this section is occupied by the surface yard, which it was desired to keep upon the level of the yard at the Fulton Street end, although the street level rises rapidly in that direction. Accordingly a retaining wall of the type shown in the right-hand wall detail was here used to enable the yard to be excavated to the desired level beneath the street at this point.



THE COMPLETED CONCRETE RETAINING WALL FOR THE NEW EAST NEW YORK SHOP PLANT OF THE BROOKLYN RAPID TRANSIT COMPANY

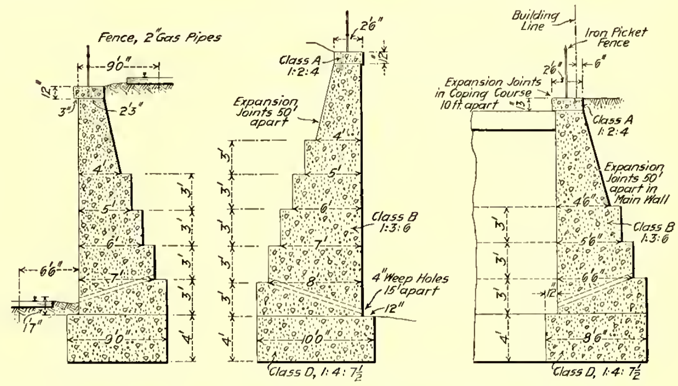
The arrangement of the yard and the connections to the elevated and surface lines are clearly shown in the ground plan drawing. The surface yard connection to the street is made at the Fulton Street corner of the property by means of three spur tracks leading to the Broadway surface line. Track connections are also made at this point for serving the shop buildings and stock houses. The connections from the yard to the elevated lines are made by means of a double-track elevated structure crossing the surface yard from the retaining wall at a point near the inspection shed to the elevated structure near the despatcher's office, as shown. This elevated structure connection is double-tracked, and has various convenient switching connections to both the east and westbound main line tracks. An important feature of the elevated line arrangement at this point is to be noted in the convenient arrangement of side tracks upon the structure, upon which outgoing trains may wait before being turned over to the operating men. This has proven in previous practice to be an important feature for facilitating operation, and consequently was studied out with a great deal of care for the new installation.

At the present time rapid progress is being made in the construction of the new yard layout, nearly all of the retaining wall and a large part of the work of filling having been completed. It will, however, be some time before the new yard will be ready for operation so that construction may begin upon the new shop plant, this being due to the necessity of preserving the present storage track arrangement during construction, in order that no interruption shall be offered to the present operation.

While the scope of the shop plant to be installed at this point in connection with the yard and inspection shed is to be very broad and far-reaching, it will still be confined to work upon the elevated rolling stock equipment. This shop will be arranged to take care of all running and emergency repairs to the cars of the eastern division of the elevated lines, and also it is intended to manufacture large quantities of supplies here for the other departments of the company. It is furthermore intended to take care of all of the armature winding and all other classes of electrical work for the elevated division which are now carried out at one of the surface division shops of the company. This will not only greatly relieve the surface shops in this respect, but also will enable the work to be specialized to the highest degree at the new elevated shop.

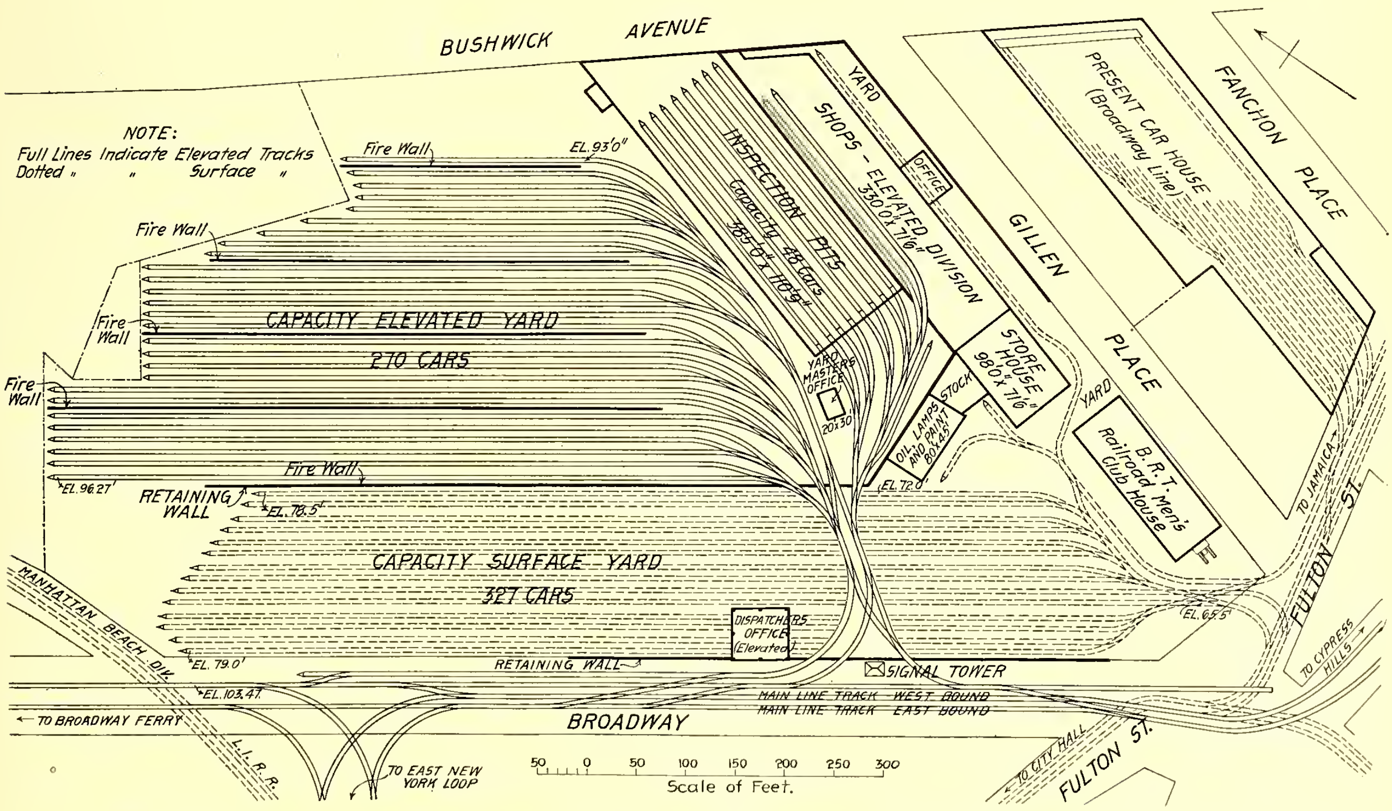
The equipment of this shop will be very complete, embracing facilities for all classes of construction, being sufficiently complete to cover the entire construction of a car if desired. The shop is not, however, intended to take care of general overhauling work, as for this purpose the large repair shops of the company located at Thirty-Ninth Street and Second Avenue will be retained for the reconstruction and overhauling work upon the elevated cars, as was referred to in the Aug. 13, 1904, issue, descriptive of the rebuilding work upon the elevated cars of this company. The latter shop, while very completely equipped for thorough and economical work, will be necessarily kept continuously employed in the work of periodical overhauling of the elevated rolling stock, this having grown to be a large and important problem, as the total number of elevated cars now operated is upward of 900.

In accompanying drawings, plans are presented of the construction as projected for the elevated shop which will be located upon both the upper yard level and upon a portion of the lower yard level outside of the retaining wall. A cross section



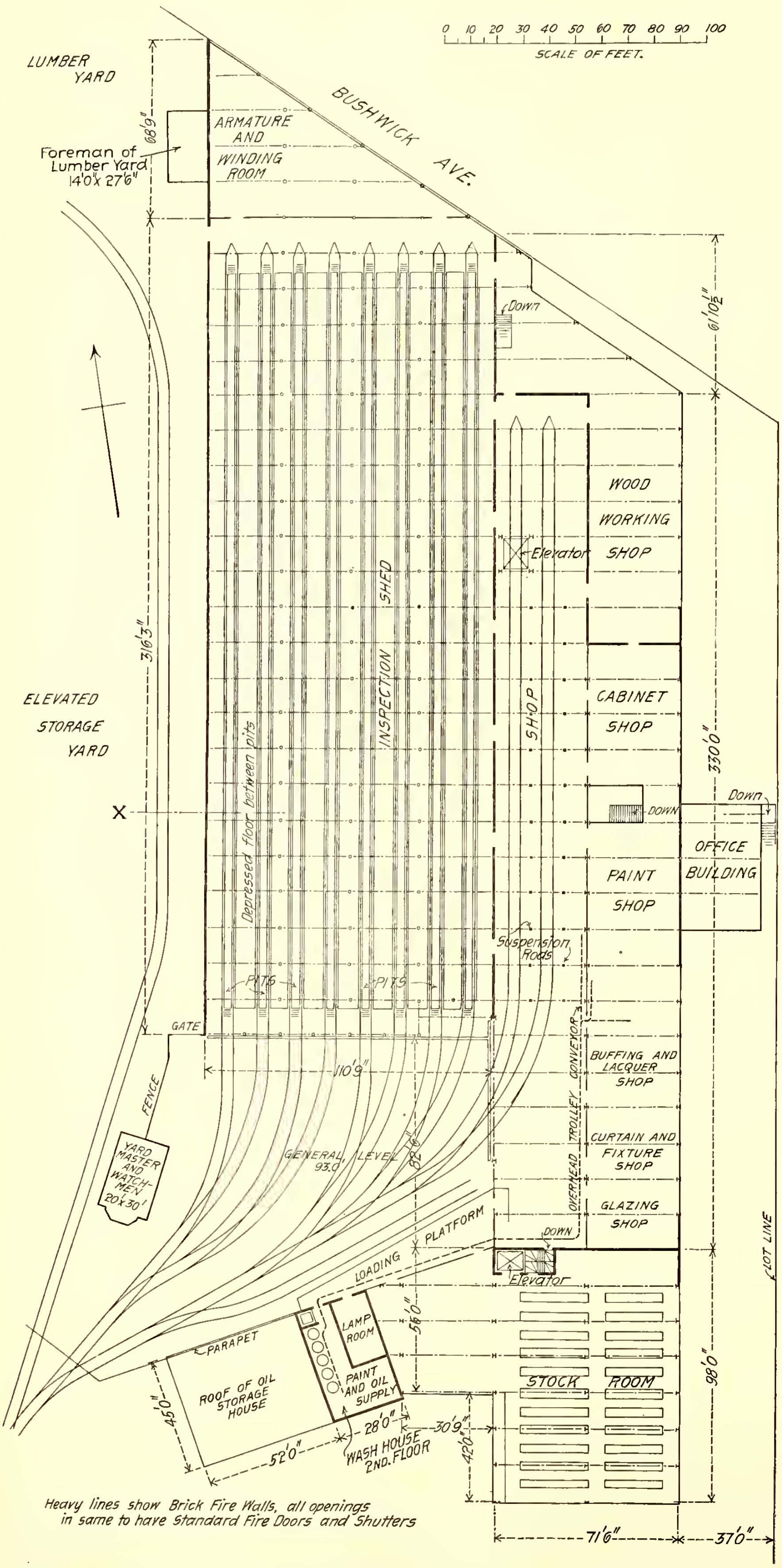
TYPICAL SECTIONS OF THE CONCRETE RETAINING WALL

through the shop and inspection shed at X-X is presented to indicate the character of the building construction chosen and the success with which the existing conditions accommodate the shop requirements. The shop plan indicates an excellent adaptation of the available space to the requirements of the shop. Both the inspection shed and the shop building are long, narrow structures arranged side by side and conveniently located for track connections. The shop portion, which is two stories in height, consists of two bays, one upon the upper level carrying two longitudinal tracks upon which the general repairs of cars will be carried on, while in the other the repair departments will be located; upon the lower level of the shop building, in one bay, is the truck and wheel department, and the other the machine and blacksmith shop.

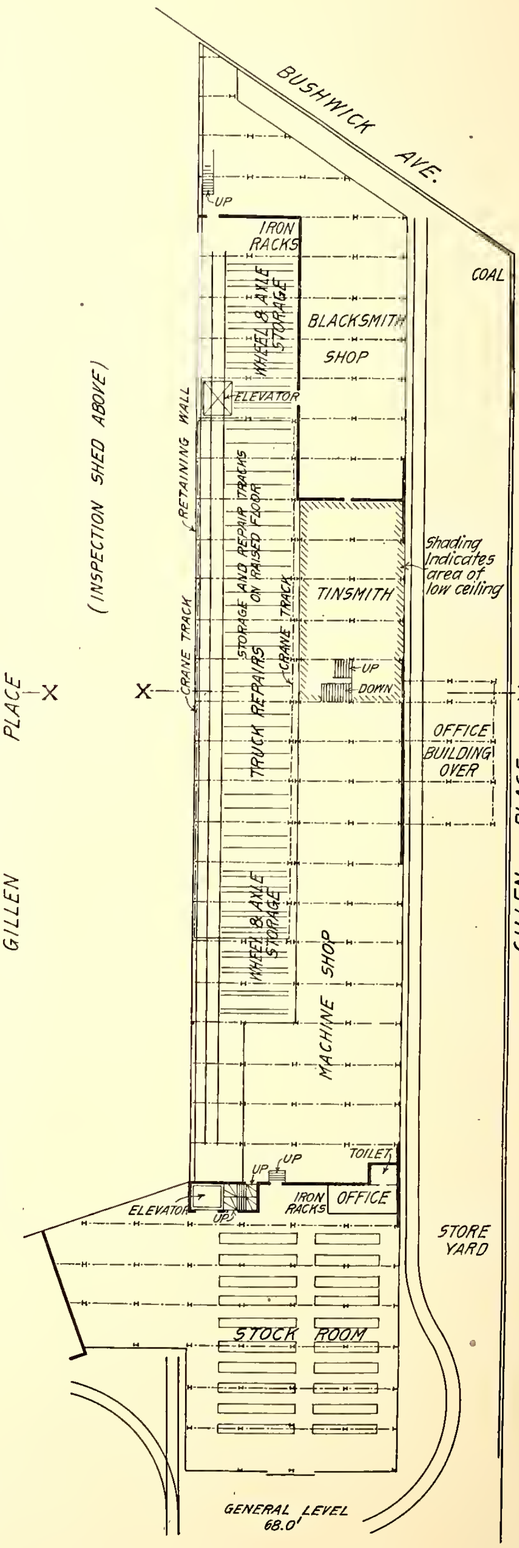


THE NEW YARD AND TRACKAGE LAYOUT AT EAST NEW YORK, SHOWING ARRANGEMENT OF SHOP BUILDINGS

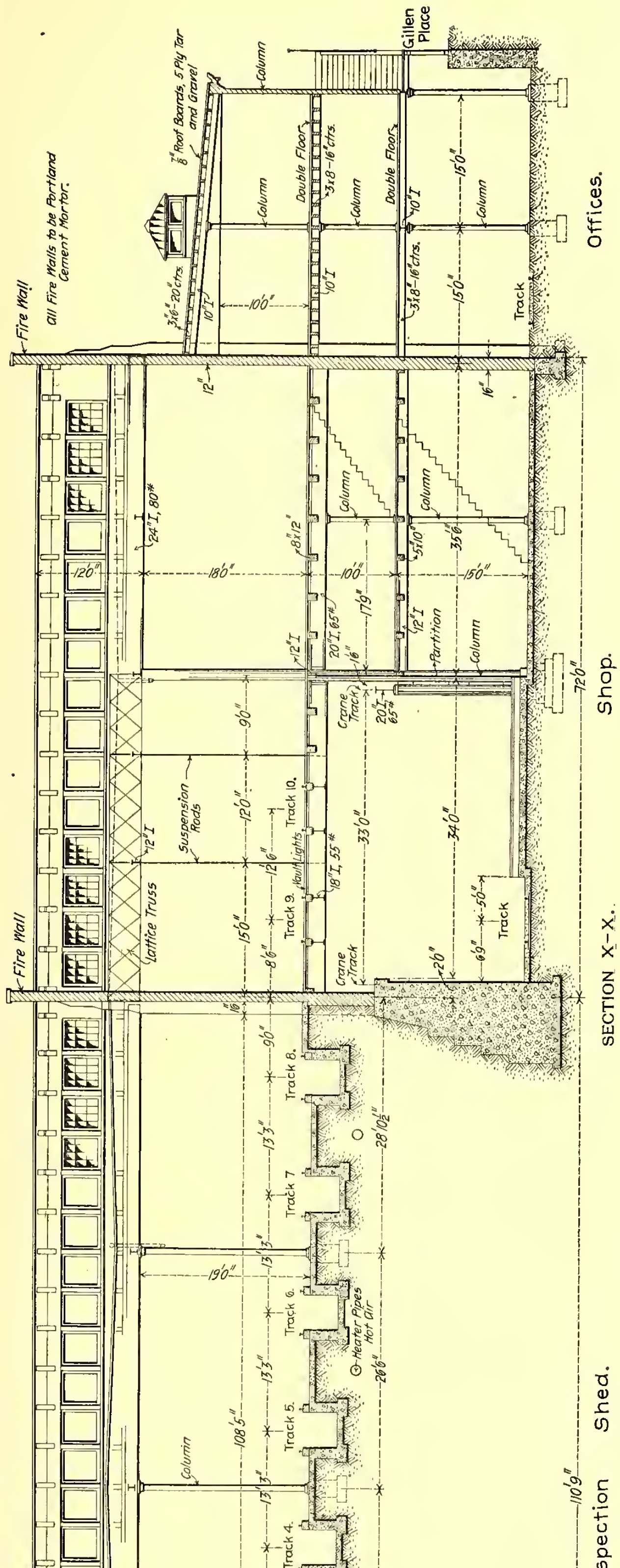
The inspection shed contains eight tracks, each of which is over 300 ft. long, so that each will accommodate a six-car elevated electric train. This will enable trains to be brought in from the road and run upon one of the pit tracks for the periodical inspection which is so necessary in this service. Here the best of care may be given them irregardless of weather; in the winter, time may thus be given them to permit of thawing off the snow and ice which naturally accumulates upon the trucks. Furthermore, the large capacity provided (forty-eight cars) will be of great advantage in permitting time to be given to the



PLAN OF THE ELEVATED DIVISION SHOP UPON THE SECOND FLOOR LEVEL OF THE BUILDING



THE LOWER FLOOR LEVEL, CONTAINING THE TRUCK AND WHEEL DEPARTMENT AND MACHINE SHOP



CROSS SECTION THROUGH THE SHOP STRUCTURE, SHOWING TYPE OF BUILDING CONSTRUCTION

inspection work upon each train, as if fewer tracks were installed the trains would necessarily have to be shifted oftener in order to cover a certain number of trains per day.

The inspection shed involves a novel feature of construction in the form of a depressed floor between the pit tracks, which has the effect of raising the cars to a sufficient height above the floor so that workmen are given better access to the apparatus beneath the car. This will be accomplished, as may be noted in the cross section, by carrying the tracks upon timber stringers bolted to the top of the pit wall on either side. The pits are of concrete construction, as are also the floors and foundations of the building. It may here be noted also that the section of the retaining wall which runs parallel to Gillen Place is made use of for the division wall foundation between the inspection shed and the shop building; the fire wall separating the two buildings is set back 2 ft. from the face of this wall on the shop side, so that the parapet of the wall serves as a runway for the traveling crane in the truck shop. An important feature of this shop is to be noted in the cross arrangement of monitors for ventilating and lighting, this being an advantageous feature in shop construction, in that the best possible daylight lighting may thus be secured without the introduction of flat skylighting; this is a feature that is being introduced in many instances of the best shop practice, and is commendable.

The shop building is a two-story structure with two bays, each approximately 35 ft. wide. As may be noted from the cross section, all car repair work will be carried out upon the upper floor, which is on a level of the elevated yard tracks. In the east bay upon the upper floor various repair departments, such as the woodworking and cabinet shops, paint shop, curtain shop, etc., will be located. The truck and wheel department will occupy the bay upon the lower floor directly beneath the car repair department, access for trucks to this level being had by an elevator to be located at the rear of the western track upon the upper floor. An arrangement similar to that in use at the shops of the Boston Elevated Railway will here be installed, which involves the use of interchangeable trucks, so that the car may be run back with one truck upon the elevator, the truck thereby dropped from beneath the car and replaced by another one of similar equipment.

The arrangement which has been worked out for the handling of trucks and wheels is interesting and novel. The elevator will drop to the lower floor level and deliver the truck upon a transfer table which will run longitudinally the length of the shop upon the depressed track next to the retaining wall, as shown. This transfer table will carry a turntable or turning platform, by means of which the truck carried upon it may be swung to right angles and thereby run off onto any one of the cross tracks which may be noted in this bay upon the lower floor plan. In this way not only trucks but wheels may be handled to and from these cross storage tracks and delivered to the upper floor with a minimum of handling and with great rapidity. This is a shop arrangement which involves features of improvement over that in use in Boston, although the scheme of using the elevator is similar.

A very complete and thoroughly equipped machine shop will be installed upon the lower floor level of the building. The machine tool equipment will embrace the latest and most improved methods of arrangement and driving, and many labor-saving features will be adopted. The blacksmith shop will be located on the same level at the rear of this department. In this bay also a mezzanine gallery will be located at a level 15 ft. above the machine shop floor, this section accommodating the lavatories and lockers. A projecting wing on the building upon the Gillen Place side will be used for the offices of the shops. As may be noted, this structure will be carried on columns, so that the yard space below will not be interfered with. This office structure will consist of two floors, one upon the level of the mezzanaine gallery in the machine shop, and the other upon the upper yard level. In the mezzanaine gallery above the tinshop, there will be provided an excellent lavatory equipment for the convenience of the workmen, and also expanded-metal lockers for their personal effects.

This entire shop arrangement is a very interesting and convenient one, and one which it is thought will be conducive to economical operation. It has been studied out with considerable care and will, it is thought, embody all that is modern and up to date in electric railway shop practice.

WORM GEARING FOR RAILWAY MOTORS

BY HENRI SOMACH

Worm gearing is undeniably one of the most efficient methods in mechanics for reducing speed, and is especially desirable in electric work on account of the ability to use it with a high-speed motor. The apparatus required is compact and light, and easily permits a reduction in speed of 1 to 12, for example,

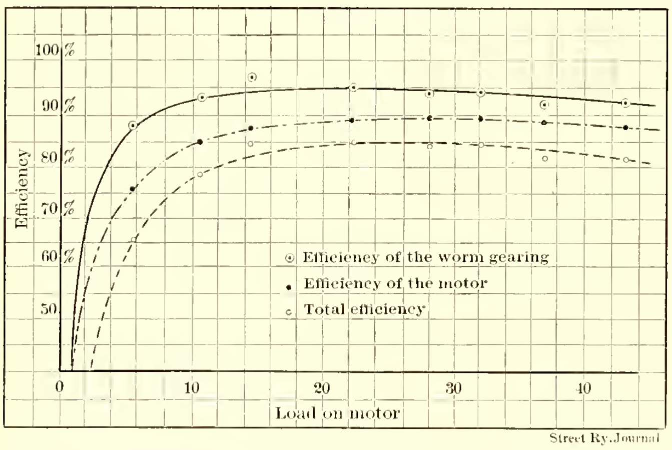


FIG. 1.—CURVES SHOWING EFFICIENCY OF WORM GEAR DRIVE

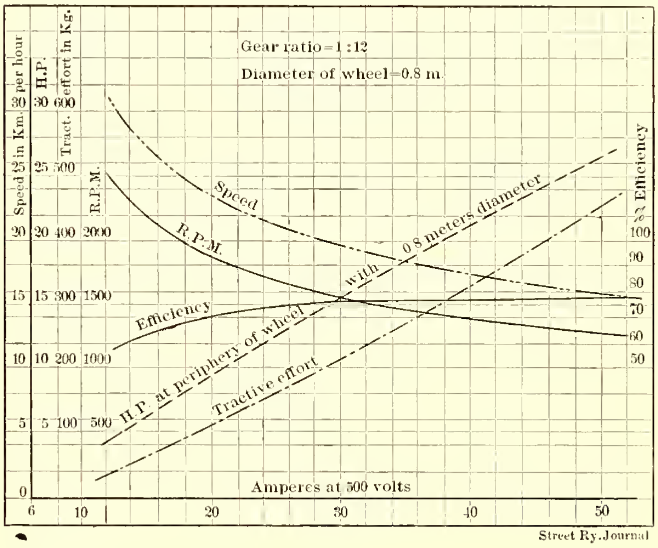


FIG. 2.—CHARACTERISTIC CURVES OF OERLIKON RAILWAY MOTOR WITH WORM GEAR

while if the same reduction were used with spur gearing, belts or ropes, double transmission would be required. The common prejudice, that there is a considerable loss in efficiency from worm gearing, is not justified in actual practice. The results with worm gearing show an efficiency of transmission exceeding frequently 90 per cent. Fig. 1 is an efficiency curve, with different loads of worm gearing employed with a 25-hp to 40-hp motor built by the Oerlikon Machine Works. The efficiency at some points on this curve is as high as 96.8 per cent, and remains above 90 per cent between one-fifth and full load. On account of these advantages, the application of worm gearing is very numerous in electrical installations. It is especially convenient in drawbridge work, where, on account of the desirability of small dead weight and compactness, it is employed practically to the exclusion of all other kinds of gearing. The results in operation have been very favorable. Drawbridges equipped with worm gearing have remained in service for a period of from ten to twelve years without any indication of wear on the gear. It is true that in this service the gearing has intermittent use, but in other cases, where it has remained in continued service, the results have been no less satisfactory. The Oerlikon Machine Works some time ago installed a trial equipment of worm gearing in continuous service, and after three years there is not the least indication of wear.

Worm gears have also been used for vehicle propulsion, but without a rigid connection between the transmission and the motor. This arrangement has not proved satisfactory, except in rare instances, and has been generally abandoned in electric railway work for the employment of spur gears. It is therefore interesting to note the recent trial by the Oerlikon Works with the object of returning to worm gear for vehicle use. The new arrangement adopted is characterized by the fact that the gear and the motor are not supported in a rigid way, and that the motor rests by itself on the portion of the truck suspended

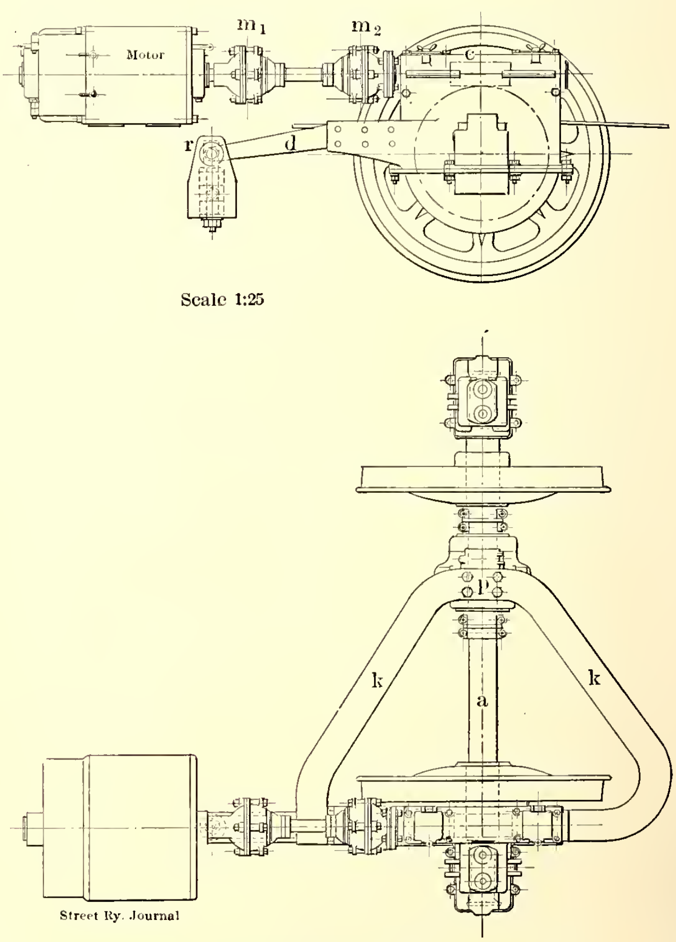


FIG. 3.—SHOWING POSITION OF MOTOR ON PART OF TRUCK SUSPENDED ON SPRINGS

on springs, as shown in Fig. 3. The worm wheel is keyed on an axle of the car; it is driven by a worm whose end thrust is taken up by a ball or collar thrust bearing. The worm and wheel are enclosed in a cover composed of a hermetically closed iron box with a cover, *c*. This gear case rests directly without springs on the axle, *a*, by means of a special journal, *p*, and braces, *kk*.

To maintain the gear shaft in an approximately constant position, it is fixed rigidly at one end to the gear case and at the other end to some point on the car or truck. This latter adjustment is jointed so as to take up the play in the suspension springs. The connection between the shaft of the motor and the worm is by means of two plates coupled together in the way shown in Fig. 3 by m^1 and m^2. The worm is of hard steel and the wheel of cast steel with phosphor bronze teeth. In the installation shown in Fig. 4, the worm consists of three turns. The pitch of the teeth is 120 mm and the pitch angle 29 degs. 55 min. The diameter of the pitch circle of the worm is 72 mm, that of the worm wheel 158.6 mm. The number of teeth on the worm wheel is thirty-six, each division being 40 mm. The reduction in speed then is 1 : 12. As shown in Fig. 4, the motors are attached to the truck of the car in such a way as to be readily accessible for maintenance and inspection. The arrangement described presents a number of advantages as compared with spur gearing, viz.:

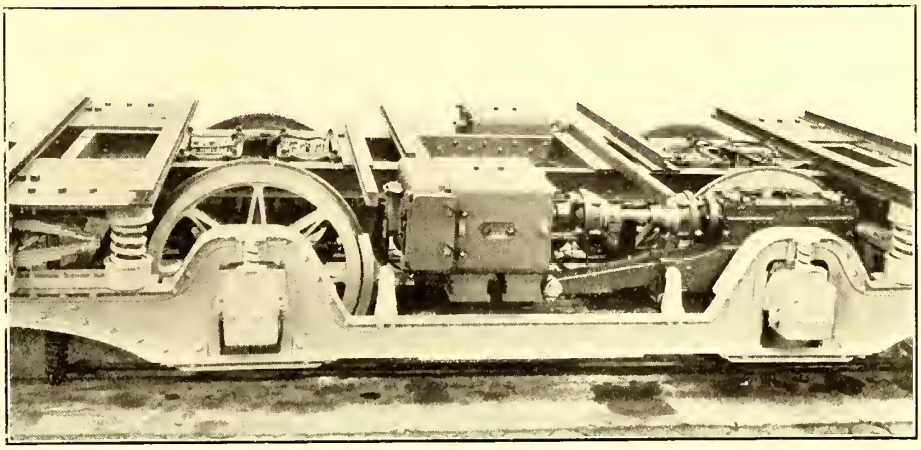


FIG. 4.—SHOWING ACCESSIBILITY OF MOTORS FOR MAINTENANCE AND INSPECTION

(1) Worm gearing permits the use of a very much higher speed motor than spur gearing. The motors are consequently much lighter and cheaper to build. Moreover, the car shown in Fig. 5 is equipped with two motors of 20-hp each, making 1200 r. p. m. Each motor weighs 300 kg instead of 650 kg, the weight of the ordinary tramway motor of the same capacity, and operating at 500 r. p. m.; thus there is a reduction in the weight of the motors of about 50 per cent.

(2) The cost of maintenance also is very much less on account of the very small wear of the worm gearing as compared with spur gearing. This has been sufficiently proved in practice in the numerous industrial installations in which worm gearing is used.

(3) The axles are driven without shock and are less noisy than the spur gearing.

(4) With the ordinary arrangement of motors connected by a spur gearing a part of the weight of the motor is not spring supported and is subject to blows caused by the rail-joints and the inequalities of the track. On the other hand, with worm gearing, all of the weight of the motor is elastically suspended, and it is not necessary to have a rigid connection between the motors and axles. This should reduce the repair charge.

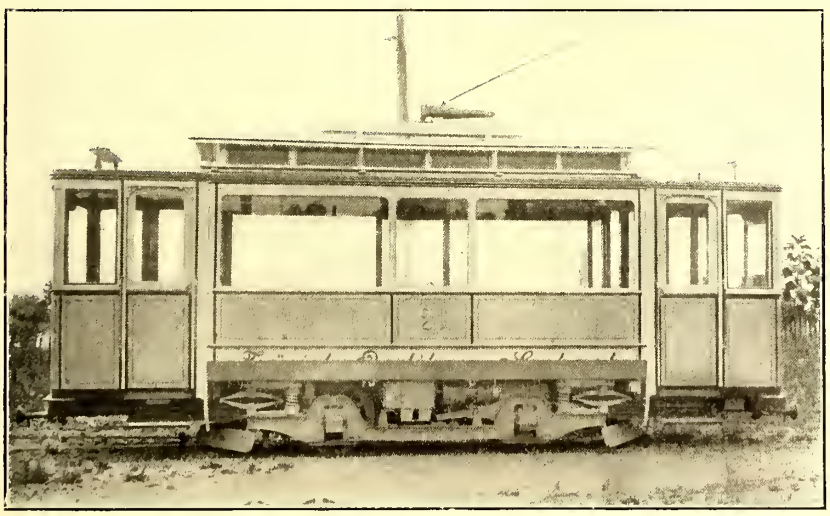


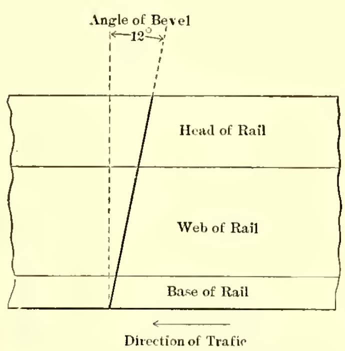
FIG. 5.—CAR EQUIPPED WITH TWO 20-HP MOTORS USING WORM GEARING

(5) Another object of the proposed arrangement is the possibility of completely insulating the motor from the ground. It is simply necessary to employ insulation between the supports and the body of the motor and between the shaft of the motor and the worm gear. In this way all short-circuits are avoided between the motor casing and the winding.

The car shown in Fig. 5 operates on the line between Zurich and Oerlikon in a very satisfactory way.

BEVELED RAIL-JOINTS IN DENVER

The Denver Consolidated Tramway Company has been making some interesting tests with rails beveled at the ends, instead of being cut off square. Beveled rail-joints have been used to some extent before in railway work, particularly on the Lehigh Valley Railroad. A radical departure has been made, however, in the Denver experiment in the plane of the bevel. In most, if not all, of the well-known experiments with beveled rail-joints in the past, the plane of the bevel has been perpendicular to the base of the rail and at an acute angle with the axis of the web of the rail. In the Denver installation, however, the plane of the bevel is at right angles to the plane of the web, and forms an angle of 78 degs. with the base of the rail. This makes the inclination from the perpendicular 12 degs., as shown in the diagram. The bevel is inclined in the direction from which traffic comes, and so far has been used only on double track.



SIDE ELEVATION OF RAIL, SHOWING ANGLE OF BEVEL

The company has installed 3 miles of track laid in this way, and after one year of service it is impossible to tell from any indication on the rail the existence of the joints. The rails were closely butted when laid. Any kind of joint can be used, but the track now laid is equipped with four-bolt, 21-in. angle plates. The company believes in short angle plates, and has used them extensively on its tracks.

The cost of having the ends of the rails milled to this bevel at the mill was 50 cents per ton. An A. S. C. E. T-rail is used, as in all the Denver work.

The Southern Pacific has discontinued twenty-five regular passenger trains between Los Angeles and suburban points, as a direct result of the competition of the electric lines.

UTILIZING OLD LEAD-COVERED CABLES IN ST. LOUIS

The United Railways Company, of St. Louis, at the close of the World's Fair, purchased a machine for putting braided covering on overhead feed wire. This machine, with auxiliary appliances, has been installed and is in operation, putting braided covering on a lot of underground cable, the insulation of which was ruined in the company's great conduit burn-out which occurred last June. The machine is capable of putting on three layers of braid. Fig. 4 shows the apparatus in operation. The reel of newly insulated wire is shown in the foreground. The reel from which the wire is being drawn is in

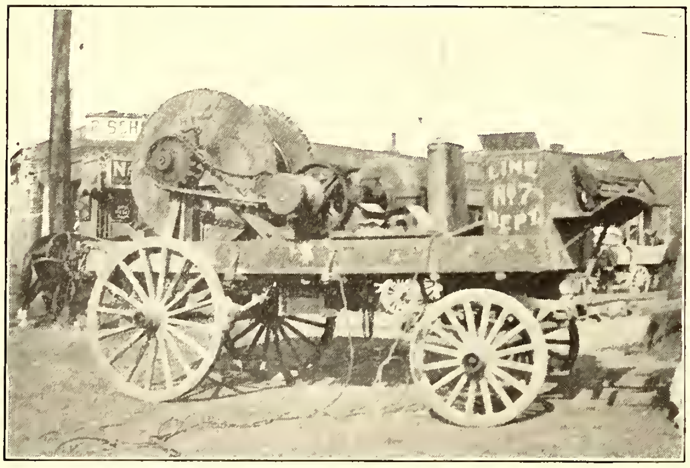


FIG. 1.—MOTOR REEL WAGON USED IN ST. LOUIS

the extreme background. The cable first passes through the insulating machine and up over the large sheave at the top, then down into a tank of hot insulating compound, up over another sheave and onto the reel of finished wire. The insulating compound tank is kept hot with a kerosene blow-torch apparatus, the tank of which is seen standing next to the tank of insulating compound. The insulating compound is mixed by the company in a separate fireproof building, the mixing pot being covered with a closed hood. The insulating compound

FIG. 2.—STRIPPING LEAD-COVERED CABLE AT ST. LOUIS

used has asphalt as a base, and paraffine and other oils are mixed with it. The cable which was being covered at the time the photograph for Fig. 4 was taken was from the company's largest line of conduit leading from the power house, which conduit was burned out. This cable, after having the lead covering removed, is given a braided weatherproof insulation and is put up for overhead feeders. The paper insulation of the cable remains intact, the braid being placed over it.

The operation of pulling this old cable out of the conduit and stripping off the lead covering is interesting. Fig. 2 shows the operation. The cable is led out of the conduit onto a reel mounted on a special wagon. The reel on the wagon is geared to a railway motor. Between the manhole of the conduit and the reel wagon is an appliance for stripping off the insulation. This appliance is shown in detail in Fig. 3. The cable passes between a set of pulleys, and a hook-shaped knife is adjusted so as to cut through the lead covering just as the cable leaves the board. This knife is seen at the left in Fig. 3. It is adjusted by means of the screw shown so as to take the proper depth of cut. This cutting board is placed, as shown in Fig. 2, on a couple of old reels and is anchored with two guy wires to stakes driven into the ground near the manhole. As the cable passes out of the lead-cutting device the lead covering rolls off and is chopped up into convenient lengths with an axe. A crew of four men is required to operate the device. The wagon is shown more in detail in Fig. 1, and is used for many other purposes by the line department. The cable reel is geared to a

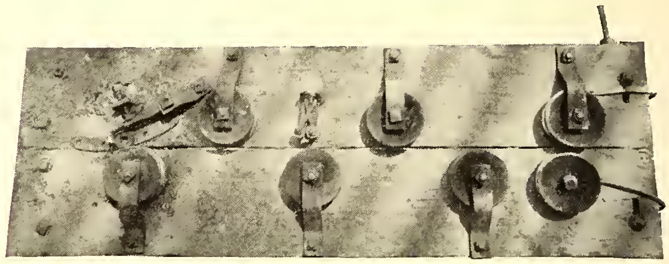


FIG. 3.—DEVICE FOR CUTTING OFF LEAD

railway motor controlled with an ordinary rheostatic controller.

The total cost of taking the lead off the cable and putting one layer of braid insulation over the paper so that the cable is ready for use on the overhead line is about 1¾ cents per foot,

FIG. 4.—INSULATING FEED-WIRE

including all labor and material. The cost of covering a bare 1,000,000-circ. mil cable with three layers of braid is about 2 cents per foot. This work is being done under the direction of Mr. Burgess in charge of the overhead line department. The company naturally has many changes in its overhead line to make this year, because the World's Fair traffic last year necessitated a great deal of copper along certain lines where the travel is now very light.

DIAGRAM FOR RECORDING OVERHEAD DATA

BY JOHN TREGONING

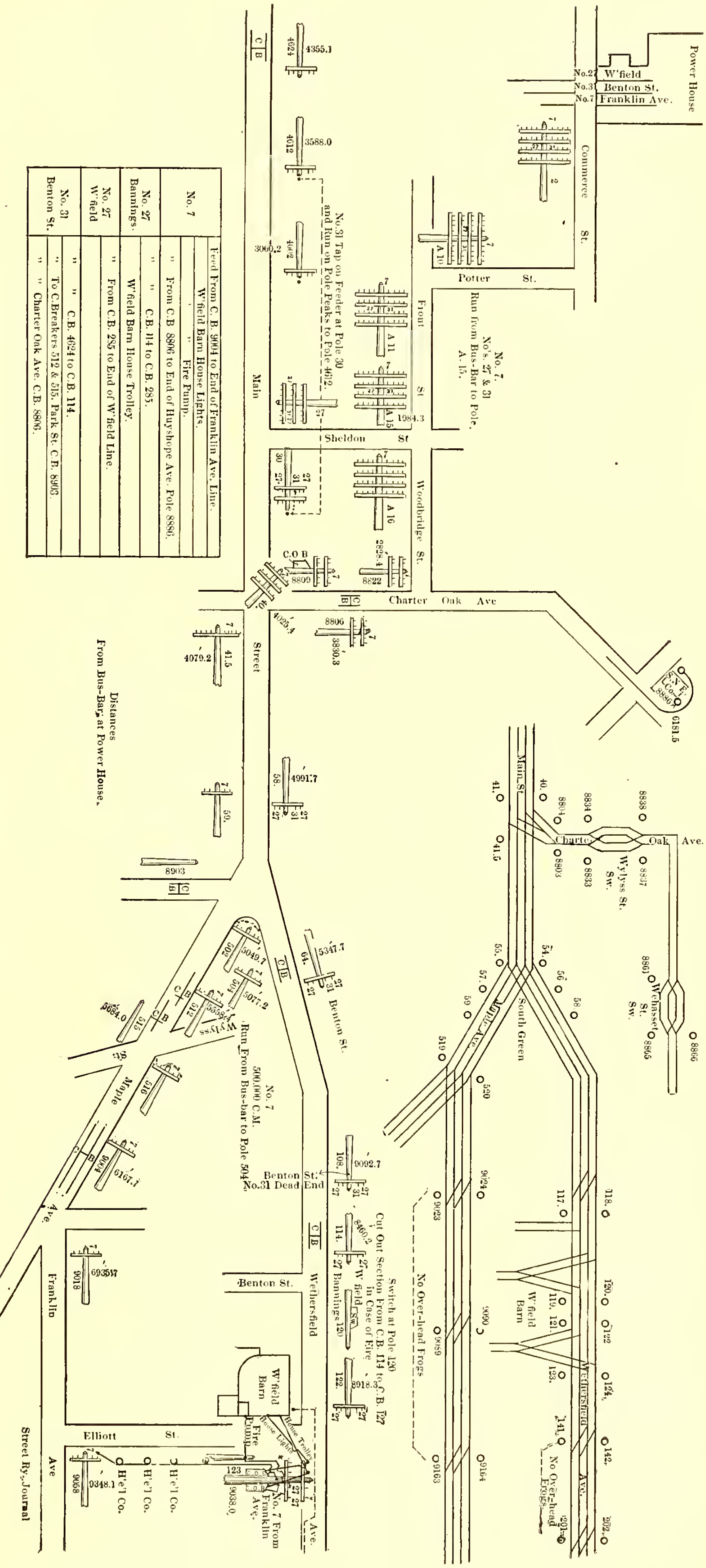
A great deal has been published about methods for recording power house and rolling stock data, but little about corresponding records of the overhead construction, although the latter causes as much or even more anxiety than any other part of an electric railway system.

The plan of overhead construction which accompanies this article illustrates the method used by the writer for plotting this information on the system of the Hartford Street Railway Company. The majority of roads have one or two men who keep a pocket record of the feeders and feeder taps. Should they leave the company's employ a new man would have great difficulty in learning the constructions.

The plan that has been introduced in Hartford does away with pocket records and places a complete plan or set of plans of overhead construction in the hands of the officials of the company. These plans are put in book form and kept at the office where they can readily be referred to at any time, and in case of changes being made, supplementary sheets are drawn up and filed with the original.

Each construction starts at the bus-bar at the power house and goes through the different streets and avenues where the feeders are laid. It shows the sections between circuit breakers (which are indicated in the drawing by the letters C, B and H), each feeder that supplies current to the trolley, pole numbers, the points where the feeders dead end and the exact length of each feeder. This records the amount of resistance to be overcome and the drop of voltage in the line at any given point. The feed taps themselves are not shown, as it is generally understood that they are cut in about every 500 ft.

There is another very important use in connection with these plans, and that is in connection with troubles. For example, a report is received that at a certain pole, whose number is given, or in its vicinity, the feeder is grounded through the insulator pin, as is often the case after a thunder storm, where iron poles are used. By referring to the map the lineman can go directly to the pole and make repairs. The same method can be applied to



PLAN OF OVERHEAD CONSTRUCTION, ILLUSTRATING THE METHOD USED BY THE HARTFORD STREET RAILWAY COMPANY breaks in trolley wires, span wires and strain wires. The pole numbers are placed on the street side of all poles and the pins are located by being on the "street" side or the "field" side, the latter phrases being known to the linemen and help the trouble hunter very much. For instance, a lineman is sent to the end of a line to make repairs, and while there receives word that feeder No. 7, on the second pin street side, pole No. 9018, is giving trouble. The man can go immediately to the point, make repairs and report the cause of the trouble in a very short time.

The Hartford Street Railway Company also has a diagram of its track construction showing the switches and cross-overs, each of which is given a name. These names are printed in the conductor's regulation book for his guidance in making reports of trouble that may occur at any of those points. The track diagram also shows the poles which support the overhead frogs, and their numbers.

NOVEL CONSTRUCTION AND WORK CAR

In the accompanying engravings are illustrated details of a unique general utility car that has been developed by the engineering department of the Georgia Railway & Electric Company, of Atlanta, with the idea of combining in one all the requisites of a construction, work, wrecking and supply car; in other words, having a car that would be used to do all the work usually accomplished by a motor drawing flats.

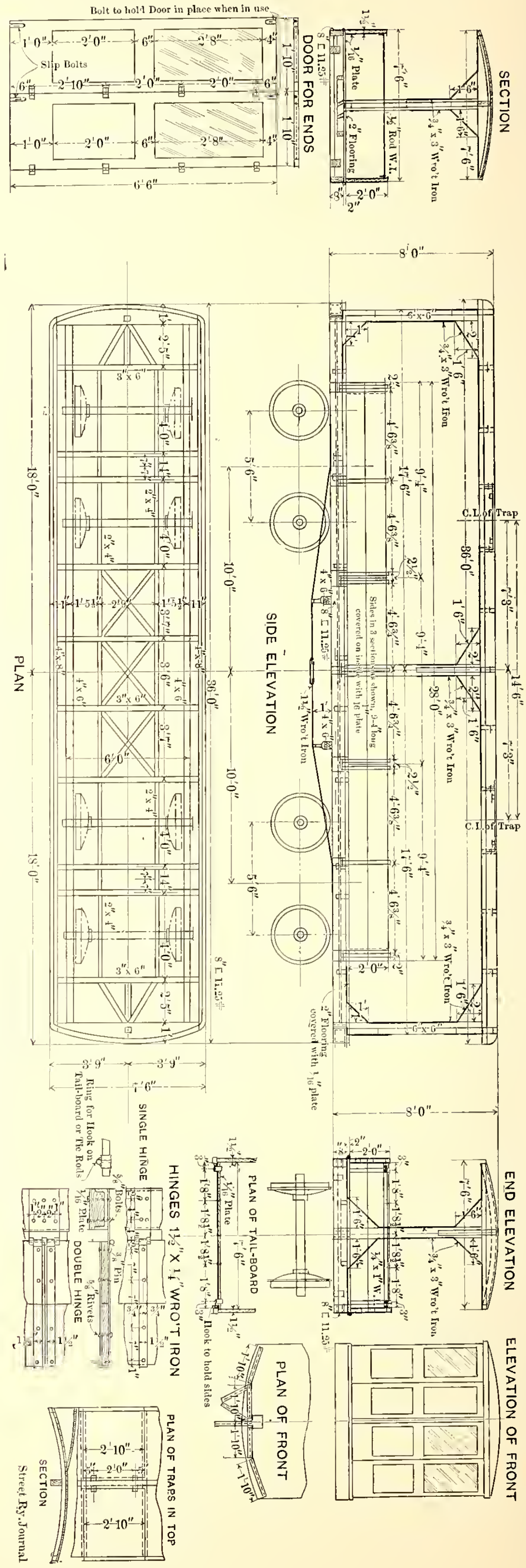
As will be noticed, the car is practically open at the sides, but has a roof, supported on posts. The object of this roof is primarily to protect the operating crew, as the company has discovered that the men can do much better work if they are protected from rain, sleet, snow, etc. Then, too, the roof serves to carry the trolley base, and also gives accommodations for keeping tools, rope, chain, etc.

The car has vestibules at each end, but these are so arranged that they can be taken off in the summer. They are also so arranged as to be folded together in front of the center posts, thus allowing long rails to be carried on either side of the center post. All city track in Atlanta is laid with 62-ft. rails, and when transporting these long rails when doing reconstruction or new work, by folding the vestibules together in the center, six rails can be carried on each side of the center post.

The car has low sides, which are hinged at the bottom, and can be swung downward, but which normally are held upright by cross rods, having at both ends hooks which engage in eyelets near the top of each side. These sides are not carried clear to the ends of the car, for the reason that, besides rails, the car is used for hauling crushed stone, dirt and sand, and if the sides were prolonged to the ends of the platforms, this dirt, sand, etc., would run out to the controller stand and brake staff, thus interfering with their proper operation. Moreover, in this event the motorman would be forced to stand in wet sand or dirt, but by arranging the sides as shown in the drawings, the controller stand and brake-dog are kept clear and the motorman has a dry place in which to stand. By this arrangement there is no loss of carrying capacity, because it is possible to carry as much material in the area allotted as the timbers of the car will stand.

As will be seen, there are two sets of trap doors through the roof. These are to facilitate the loading of broken stone. The company operates its own rock quarry and rock crusher, from which it obtains all the stone used in its concrete and ballast work. The crushers are so arranged that the stone after being crushed is carried up into elevated bins and deposited through a rotary screen in four bins, each containing a different size stone. A spur track runs alongside these bins about 8 ft. below the level of the bin floors. When loading, the car is run under the bins, and by means of adjustable spouts, the particular size stone wanted is delivered directly into the car through the trap doors.

As pointed out, in designing this car an attempt has been



STANDARD UTILITY AND WORK CAR, GEORGIA RAILWAY & ELECTRIC COMPANY

made to adopt it to a wide variety of uses. Of course, it would be easy to build one car for hauling rail, another for dirt, another for stone, etc., but this would require the use of too many equipments, and in changing from one job to another the crew would have to put up their car when hauling rails, for instance, and go and take another car for another purpose, perhaps to make only one or two trips. But by the arrangement described, the one car serves all purposes. The car is mounted on the company's standard double trucks, is fitted with four Westinghouse No. 57 trucks, and has hand and air brakes.

Acknowledgment is made for the drawings and foregoing data to W. H. Glenn, superintendent roadways for the Georgia Railway & Electric Company.

FROM A CONDUCTOR'S POINT OF VIEW

The following suggestions have been received from a conductor on a large electric railway system, and are published here as being, possibly, of practical value:

SMALL CLOSETS IN CARS

There should be in every car a small closet or cupboard, about 15 ins. x 5 ins. x 4 ins., in which the conductor can keep his day cards, necessary tools for small repairs to the register, fuse wire and other small articles.

HANDLING FREE TICKETS

Nearly every street railway company has had more or less trouble with free tickets, as the free rider sometimes gives more than one ticket to the conductor, thus opening the way for discrepancies in the conductor's report. It also sometimes happens that the pass privilege is abused and the free tickets find their way into the hands of persons other than the one to whom they were issued. The following is offered as a simple suggestion for doing away with these difficulties: Bind the free tickets in a book and number the coupons consecutively. Issue orders requiring the conductor to tear the coupon from the book himself, and instruct him to see that the number of the ticket next higher than the one that he is taking for a fare is still in the possession of the passenger tendering the book. The practical operation of this matter would be as follows:

The passenger offers the conductor free ticket marked 168,778. The conductor sees that ticket 168,779 is still in the book, and if it is not he refuses to accept the coupon as fare. Suppose a conductor on May 1 receives tickets numbered 168,770, 168,771 and 168,772 from a given book, and on May 2 the holder of the book gives another conductor coupon 168,774. If ticket 168,773 is presented at a later date, the matter should be looked into.

SLEEPING QUARTERS FOR EMPLOYEES

Many car houses have considerable room that is not used for any very important purpose. This room could be utilized to great advantage as sleeping apartments for the conductors and motormen. If a number of cots were always on hand they could frequently be used to the benefit of the company and the men, as a certain number of conductors and motormen could sleep at the car house and would be available in emergencies, such as snow storms, possible fires, break-downs, extra travel, etc., and the arrangement will insure some of the men being on hand early in the morning.

DISTURBANCE REPORTS

It is essential that a street railway manager should endeavor to keep its cars as free from every objectionable feature as possible. To do this it should require its conductors to turn in a report of every occurrence in the nature of rowdyism that happens on the cars. It sometimes happens, for instance, that a particular line serves a picnic ground or ball room whose patrons consist usually of a rather tough element. The conductor who takes these people home late at night will often have trouble getting the fares, as some persons in the crowd will be in a fighting mood and may use indecent language. The management should be informed by report from the conductor of every occurrence that is in the nature of rowdyism, so that the evidence may be laid before the proper municipal authorities with a view to having the trouble stopped.

CONDUCTORS AND THE BOND COMPANY

A road that requires its conductors to procure a bond from a bond company should require the surety company to furnish each of the conductors with $5 change money. A conductor with plenty of change is able to perform his duties with greater facility, as he can collect his fares with greater rapidity, and as the bond company is in a position to protect itself, it could furnish this money without any hardship.

EMERGENCY WAGON

The quite common sight of a repair wagon galloping along beside a street car has prompted the suggestion that if the repair wagon could be designed to be hitched to one of the regular cars there might be some saving in time and expense. Of course, there are cases where horses can get nearer the obstruction or break-down than can a car. At the same time, in the majority of instances, the wagon could be hitched to a regular car and drawn to the point of trouble as quickly as, or possibly more quickly than, the horses can draw it. It might be said that it would be better to have a regular construction car with its own motors, but wagons can be built more cheaply and could be hitched to the first regular car passing the emergency station. It would also be possible to have several of these wagons stationed at various points on the system, and it would not be necessary to maintain teams for each wagon.

In this connection there is also the matter of the construction crews working in very cold weather on the top platform of a wrecking wagon or car. It often happens that on particularly cold days the men are hampered and can do very little work because their hands are nearly frozen. It would seem quite feasible to put a small, well-protected stove on the platform, or, better still, an electric heater taking current from the line. This heater would not take up much room, and if the men could warm their hands occasionally they could do their work enough faster to make up for the small expense of its installation.

COMING CHANGES IN SUMMER SCHEDULES OF LOS ANGELES INTERURBANS

The electric railways from Los Angeles to the beaches have begun figuring on schedules for the coming summer season. The Pacific Electric Railway Company announces that it will place in service through the warm weather forty more cars. Long Beach will have a twelve-minute service, with cars as often as the traffic will warrant on Sundays and holidays. One hundred cars on the lines to Long Beach, Huntington Beach, Alamitos Bay and Bay City will be the average number in operation. As soon as the right of way is secured, the company will be operating four tracks to tidewater. The Los Angeles-Pacific Railroad Company announces a service to Hollywood of seven and a half minutes, with fifteen-minute service to all of its numerous beach connections. This company has also decided to place in commission six cars to haul express matter exclusively. This will increase the company's express service to four cars a day to and from the beaches.

A decision in Michigan is to the effect that a railway company has no right to charge extra for limited service. Albert C. Widdis, a Detroit lawyer, purchased a ticket over the Detroit, Ypsilanti, Ann Arbor & Jackson Railway Company's line from Jackson to Detroit. He boarded a limited car and the conductor demanded 20 cents extra. Widdis refused to pay and was ejected from the car. He brought suit for damages and was awarded a judgment of $100. The company will appeal the case, and it will probably reach the Supreme Court.

THE BERLIN-ZOSSEN TESTS AND THEIR RESULTS

At a meeting of the New York Electrical Society, held in New York, May 24, an interesting address on the Berlin-Zossen tests was delivered by Charles A. Mudge, formerly chief engineer of the railway department of the Allgemeine Elektricitäts Gesellschaft. Mr. Mudge took a prominent part in the high-speed tests of 1903. He first described the test track, which was 14½ miles in length and had only two decided curves, of 1¼ miles radius each. The first occurred 3⅛ miles from the car house at Marienfelde; the second, 7 miles further on, leaving 4⅜ miles to Zossen. This practically divided the line into three parts—4 miles at each end for acceleration and 7 miles for running in the middle—with almost no grades, conditions about ideal for the tests contemplated. The apparatus installed in the Allgemeine car differed quite materially from that installed in the Siemens & Halske car, and the following description refers only to the apparatus used in the Allgemeine car:

The car body was 69 ft. long and 9¼ ft. wide, and was divided into three compartments by a so-called machine room, 12 ft. long in the middle, which contained the starting rheostat and high-potential switches, and was not allowed to be occupied while current was on. The other two compartments were utilized for measuring instruments and for passengers, and were connected by a narrow passage through the machine room.

On either side of the machine room underneath the car floor the transformers were fastened. The six-wheel trucks were spaced 43 ft. 7⅝ ins. from centers, and the 49 3-16-in. wheels had a base of 6 ft. 3 ins., which was increased later to 8 ft. 2½ ins. Three-phase current was used, and the highest recorded voltage in the car during any test was 14,150. The weight of the complete car with fifty passengers was 100 tons (2000 lbs. to the ton), which was increased 4 tons in the last year of the tests by alterations necessary to accommodate the new trucks and by balancing weights.

The tests of the first year, 1901, formed what might be termed a "try-out" period. Before the car was taken from the works all apparatus was thoroughly tested, and for this purpose a stationary iron bed-plate, having four run wheels, was arranged under each truck, the wheels on the bed-plate having profiles similar to rails, and made wide enough for brake straps of dynamometers. In this manner the motors were run up to speeds corresponding to 200 km, and the power required was measured with the dynamometers.

Very elaborate tests were also made on bearing frictions at high speeds, and interesting data were collected on the properties of different lubricants under severe conditions of pressure and speed in connection with different metals and alloys. From the results of these tests the rolling friction was estimated to be about 10 lbs. per ton at 125 m.p.h., which was somewhat in excess of the values found during the actual operation of the car. Numerous other preliminary experiments were made to determine the air resistance, the proper form of the car end, the best design of current collector and an efficient brake rigging. After all apparatus had been given as thorough a shop test as possible, the car was hauled approximately 500 miles by a steam locomotive in order to loosen it up. After this many different runs were made, the maximum speed obtained during this year's tests being 100 m.p.h.

It was noted very early in these tests that the permanent way was not at all suitable for running cars of this weight at such speeds. It was decided to replace the 67-lb. rails with heavier ones of 82½ lbs. per yard, and to increase the size and number of ties per rail over the middle portion of the road, which was also furnished with guard rails for 10 miles of its length.

Above 90 m.p.h. the car began to sway from side to side decidedly, and it was decided to support a portion of the weight of the car, which was carried entirely at the truck center, on side bearings on the truck frame, and to employ a flexibly supported center-pin bearing in the truck. Both features were admirably carried out in the design of the truck used during the last year of the experiments. The braking facilities were also not at all sufficient, although two shoes were applied to each of the twelve wheels. This was due mainly to the arrangement of levers and to the fact that only two brake cylinders per truck were used, which was changed later to four cylinders per truck, and to a much simpler lever system.

The second year of the tests, September, October and November, 1902, was occupied mainly in determining the train resistance at different speeds, in measuring the power required for different loads and speeds, in determining the losses in the transmission line, in collecting the necessary braking data for computing the coefficients of friction for different speeds, and in determining the alterations necessary to be made in the car and the permanent way, to permit a speed up to 125 m.p.h. These tests were conducted up to a speed of only 75 m.p.h., as the observations of the previous year showed that the permanent way would not stand much higher speeds.

The brake tests made in this year were not as satisfactory as those in the following year, on account of the complicated brake rigging used, which did not allow of easy adjustment. They showed, however, a maximum retardation of 2 m.p.h. per second at 70 m.p.h., with a total brake pressure equal to 155 per cent of the weight of the car. The tests of 1902 were principally of value in showing what alterations in the car and permanent way were necessary in order to be able to run at higher speeds.

The tests of the third year, which were the most elaborate and formed a reliable check on the previous tests, give a substantial basis upon which any high-speed work of the future may be attempted. Data of very great value were secured on the much-discussed question of air resistance, and although the formula may not be straightened out to suit everybody, it was shown positively that if a car is run, for instance, 50 m.p.h., it will have a maximum air pressure of about 7 lbs. per square foot at the front of it; if the speed is doubled there will be four times this pressure, and if the speed is tripled there will be nine times this pressure. If the nose of the car is shaped properly, these figures will be reduced 10 per cent. Also, if the 1000-ton car is run at 50 m.p.h. on a level track without paying much attention to how the front is shaped, it will take about 150 hp. If the speed is doubled it will take six times this amount of power, but if the speed is tripled—i. e., the speed is 150 m.p.h.—it would be necessary to supply about eighteen times the amount of power required to run at 50 m.p.h. These facts are not so serious as they seem when we consider that the amount of power necessary to drive a car or train at 100 m.p.h., with which we would be content at present, can easily be applied to the axles without any alteration in the standard gage, and in fact with very little, if any, change in the standard truck construction.

At the very outset of the 1903 tests, considerable difference was noticed in the behavior of the car when running above or below 100 m.p.h. At about this speed the car seemed to take on a swinging lateral motion, which at times became so pronounced that it endangered the overhead work and created a feeling of insecurity in the passengers. The cause of this was found to be the unsymmetrical disposition of the motors and transformers on the car. This was ascertained by taking the weight of the car under each wheel, which showed a maximum variation of 1½ tons in some cases. It was counteracted by placing weights along the floor of the car 4½ ft. from its center line at each truck, after which no further vibration was noticed, even up to the highest speeds.

The braking results of this year showed that the curve of retardation, instead of being straight, has a most undesirable peak at each end. This indicates that for ideal conditions it is necessary to increase the brake pressure a few seconds after it has been applied, and then to leave it in charge of an automatic device which decreases it as the speed decreases and as the coefficient of friction increases. For instance, it was found to take about seven-eighths of a mile to stop the car when running 110 m.p.h., the initial brake pressure being 150 per cent of the weight of the car. If there was some means of keeping the retardation constant, the car could have been stopped in three-quarters of a mile by using the same pressures. Under the most favorable conditions the car could not have been stopped in less than ½ mile when running at 110 m.p.h., which would require a retardation of 3¼ m.p.h. per second, which is about the limit of braking with this type of brake apparatus. The pre-eminent value of the braking system employed lay in the fact that it never failed in its operation during all the tests made and the feeling of security which its absolute reliability inspired.

The observations and experiences gained in these tests suggest the use of the following points in approaching a similar problem:

(1) Keep the car body as near the rails as is possible.

(2) Arrange all heavy pieces of apparatus so that their centers of gravity lie in the center of the car, or symmetrically placed to it, and as near the earth as possible.

(3) All apparatus mounted above the car floor should be as light as its design will permit.

(4) Make the overhead trolley contact above the car, in preference to the side of the car.

(5) Support the motors flexibly on the axles of the trucks.

(6) Give the front end of the car a wedge shape.

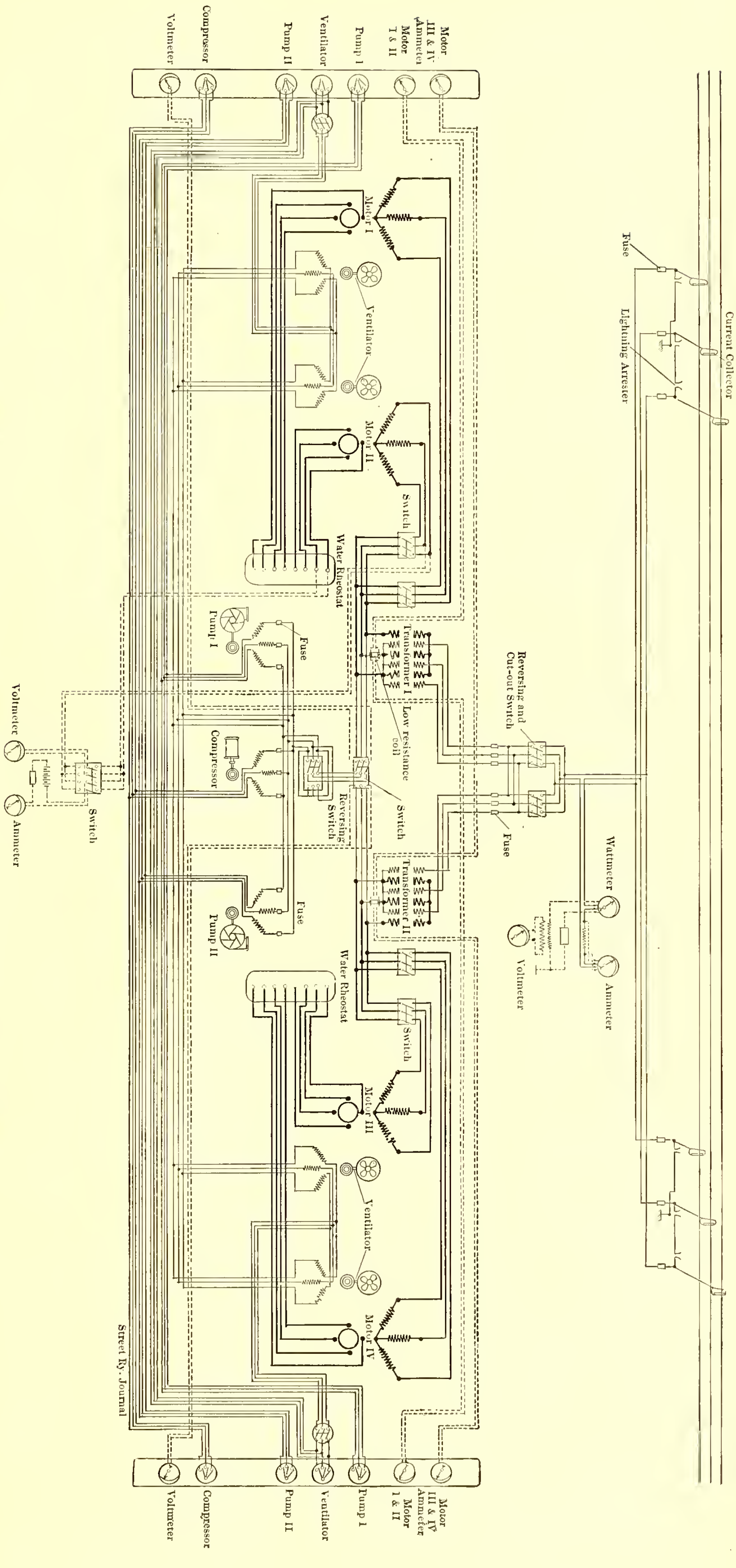
(7) Support the car body on the truck frame at some distance from the center bolt, and allow it a flexibility in a line at right angles to the track, independent of the truck.

(8) Make the total wheel base of the truck of ample dimensions and not less than 20 per cent of the length of the car.

(9) Build the road as straight as possible, and where more than one track is used make them further apart than present practice would suggest.

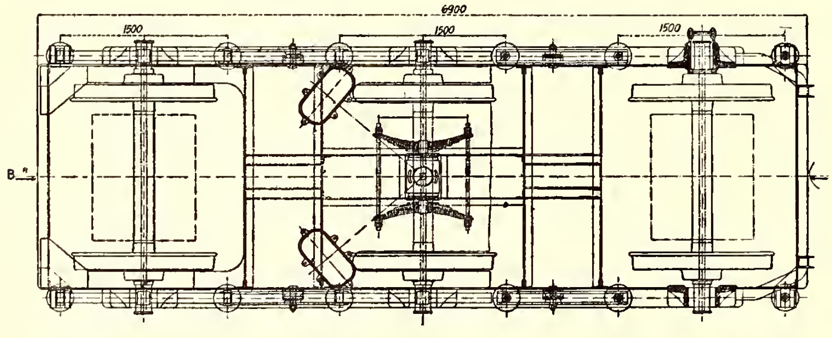
(10) On curves make the approaches of the elevated side of the track longer than usual.

If it were possible to have the

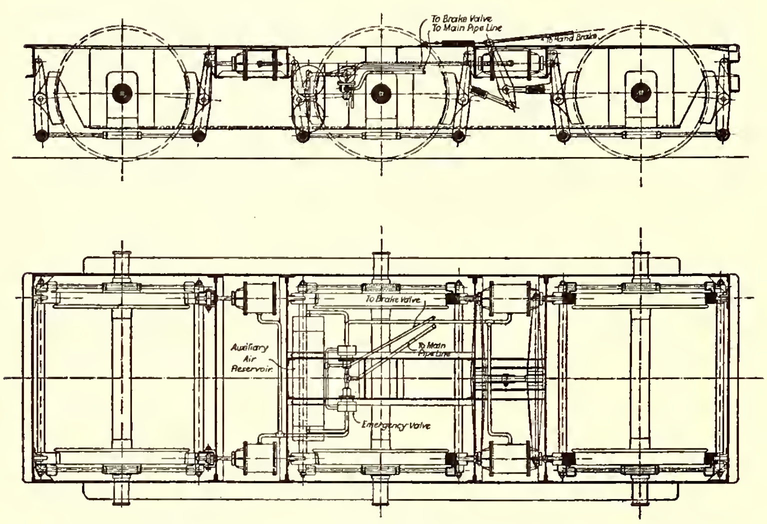


CAR WIRING DIAGRAM, SHOWING METHODS OF CURRENT COLLECTION, DISTRIBUTION, MEASUREMENT AND PROTECTION wheels along the sides of the cars and the rails between the floor and roof lines, the car would travel very comfortably. Any condition approaching this, as by keeping the car body near the rails, would share in the benefits thus derived.

A German engineer of considerable prominence has advocated lowering the floor of the car between the trucks, in order to make it ride steadier, utilizing the space above the trucks for second and third-class passengers or for freight and baggage. Although this might be too radical a change in designs of standard practice, and would not harmonize as well with conditions here as with those abroad, it would undoubtedly give good results. That all apparatus should be symmetrically mounted in relation to the center line of the car was very evident as the 100 m.p.h. figure was approached. The Zossen mo-



PLAN OF UPPER MEMBERS OF TRUCK, SHOWING SIDE AND CENTER BEARINGS



PLAN AND ELEVATION OF TRUCK, SHOWING ARRANGEMENT OF BRAKING APPARATUS

tors were mounted slightly out of the center line of the truck, and it was found necessary to use 275 lbs. per motor to counteract this.

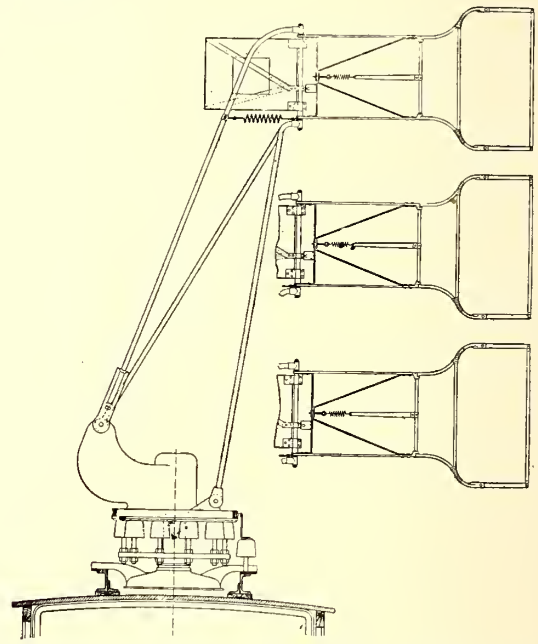
All apparatus above the car floor should be light. This applies particularly to the trolley construction. If the trolley for high-speed work is to be of a light construction, which is the tendency of most designs abroad, particular attention must be given to the form of the exposed surfaces, on account of the high air pressure, and means must be applied to counteract it. When the current is collected at the side of the car, as in these experiments, any slight swaying of the car is at once felt by the trolley, and the higher the current collectors are placed from the ground the greater is this disturbance. The trolley wires, as placed in these tests, were also very sensitive to cross winds, and even to the slight pressure of the sliding bow against them, necessitating spacing the supporting poles closer together than they were originally placed and stretching the wires themselves with very high tension.

Passengers in the car could hear very distinctly the click as the trolleys passed over each support, showing that they received a slight blow at each of these places, detrimental both to the trolleys and to the insulated supports. Through the experiences gained with this type of trolley it would seem that the current could be better collected above the car roof instead of at its side, in which case it does not matter if the motion of the car is transmitted to the trolley. In fact, if the bow form is used it would be desirable. In this connection the speaker read a few notes from the log he kept during the tests, as follows:

MONDAY, OCT. 12, 1903

Cold and windy; rained throughout the night; rails wet. Left barn at 9.30 for Zossen; 35 periods, 11,000 volts. Maximum speed, 140 km.

After leaving the car house car was stopped about ½ km out to see if trolleys were working right. Pressure and adjustment all right; started up at 500 amps. per motor. Took the first 2000-meter curve at 100 km, then ran up to 138 km. Trolleys acted fairly well, except in taking curves, when they would leave the wire. Sometimes on level they would also leave the wires on account of swinging of car, as well as swinging of wire itself, caused by the wind. Got to Zossen without accident. Waited fifteen minutes, then started back. All went well until about 6 km from shed, when one trolley was torn away by catching into insulator. This seemed to have broken the overhead work, as four other trolleys were immediately torn loose, leaving only one (upper B end) intact. Cut out all apparatus and coasted into shed from 120 km speed. As soon as we got out of the car our first impressions, after looking toward its top, were that the trolley question was not any nearer a so'ution than before.



ELEVATION OF TROLLEY, SHOWING THREE COMBINATIONS OF SPRINGS FOR EACH TROLLEY, AND VANE FOR BALANCING THE AIR PRESSURE ON THE COLLECTING ARM AT HIGH SPEED.

The idea of having the trolleys on six separate poles does not seem to be the best. The scheme of two poles might be better, as the trolley bows would lie directly above each other, and in taking curves and supports they all would strike together, making it easier to keep on the wires as the car turns. This may necessitate stronger supports, as the blow from the trolley would be much greater, being all delivered at the same instant, instead of one after the other, as is the case with the construction used. Much of the trouble which was experienced in getting the trolleys to work properly might have been avoided if it had been possible to place the contact wires above the roof of the car.

If the motors are direct connected to the axles, a part, at least, of their weight should be flexibly connected to it. There is a certain oscillation given to all the parts on a car moving at such high speeds, and it often occurs, through the unevenness of the roadbed, or slight inequalities in the rails, or the motion of the car itself, that a certain oscillation of a heavy piece of apparatus will be met out of step. For instance, the motor will be going down just as a part of the rail is coming up, and a severe blow will be the result. A little flexibility of these parts will greatly reduce the force of this blow. At speeds over 100 m.p.h., it very often seemed as if the rolling friction were taking a rest and that the car was actually floating for short distances, after which the observers would notice very distinctly that gravity had not disappeared, and it was almost possible to hear the rails groan under their extra burden. It is at such times that the flexibility of the apparatus is mostly needed; not so much when passing over rail-joints or frogs, as the car doesn't take much notice of them, and is far beyond before their effects could be felt, but just at those moments when the apparatus seems to be furthest out of synchronism with the car. Since it is impossible to build an absolutely level and straight track, conditions can be helped very much, and the comfort of the passengers increased, by having heavy pieces of apparatus flexibly supported in the car.

Giving the car a wedge-shaped construction may not be possible when using the vestibuled type with multiple-unit control and no definite end relation, but in this case it may be advisable to have a portable wedged-shaped engineer's cab on wheels, capable of being quickly attached to the front of the car in making up the train.

It was found to be a very good thing to hold the car body firmly to the truck frame at points equally distant from the center pin, also to allow it a movement independent of the truck, parallel with the axles. The trucks take curves much more quickly than the heavy car body, which requires a certain amount of time to swing it out of its straight line path, and this should not be attempted too rapidly. The car should not receive a blow to turn its nose in the new direction, but a gradual increasing pressure until it is turned out of its former course. This was very well accomplished by mounting the center pin bearing flexibly in the truck. The pin was held in its middle position by 1½ tons pressure, and could be moved out of this position for 1 3-16 ins. to its furthest limit by the addition of about 2¾ tons pressure. This had the effect of swinging the car body more gradually into the direction taken by the trucks, and the shock was considerably less than that experienced with the trucks used in the first year's tests.

If roads are built with few curves, it is advisable to take full advantage of the fact and make the wheel base long. The 30 per cent increase of base in the truck used in the last year's tests was a noticeable improvement over that used in the previous tests. With a greater distance between wheels there is a better chance to equalize the weights upon the axles, since the lever arms and springs between them may be made longer, and consequently more sensitive and easier to adjust. In three-axle trucks the motors will most likely always be mounted on the outside axles, making it necessary to carry a greater percentage of the weight of the car body on the middle axle than is carried on the outside ones. As this weight fluctuates considerably, this fact must not be overlooked in designing the equalizing lever arms of the truck, as otherwise the load will be unequally distributed on the axles and possibly disturb the smooth running of the car.

The track used for these tests was built at a greater distance from the main line track than is customary to place parallel tracks in this country, and consequently the air pressure effects of trains moving in opposite directions, as well as in the same direction, could not be observed very closely. It was evident, however, that there was a slight disturbing influence in the smooth running of the car whenever it passed another train. What this would have amounted to if the tracks had been placed nearer together it is impossible to say, but it is a point that would have to be considered in building new lines, and would suggest placing the tracks further apart than is present practice.

The two curves of 1¼ miles radius were built with an elevation of 3⅛ ins. of the outer rail, the approaches of which were 165 ft. long, according to the standard practice of the State railways. These approaches were found to be too short, as the car gave a decided lurch in taking them when traveling over 90 m.p.h., so they were increased to 330 ft., or twice their original length, after which the car rode over them smoothly.

It may be necessary to adopt a signal service somewhat different from those at present in use, as in traveling at these speeds it is more difficult to recognize colors and to distinguish the forms of objects than at lower speeds. In passing stations at 125 m.p.h. it was not possible to recognize persons standing upon the platforms, and only those at a distance of 50 ft. and over could be approximately identified. On dark and rainy days it was quite impossible to read signals at this speed, except when of large dimensions or of very pronounced color. This would suggest placing the signals in the car itself, operated electrically either by direct contact or through inductive means. Such a system was tried at Zossen and worked perfectly, even at the highest speeds. An insulated piece of angle iron was placed alongside of the rail, it and the rail constituting two poles of an electric circuit. As the car passed over this section contact was made with the angle iron by a brush which led current through a magnet in the car, releasing a spring and allowing a disc to fall in front of the motorman, the circuit being completed through the wheel. A system on similar lines could easily be arranged to ring different bells, or to operate different colored discs in the engineer's cab, thus relieving him of the strain upon the eyes caused by passing so many objects which naturally distract his attention.

DISCUSSION ON LIGHT ELECTRIC RAILWAYS AT CHICAGO

A paper on "Light Electric Railways," read before the Chicago branch of the American Institute of Electrical Engineers, May 23, by J. R. Cravath, was printed in abstract in the last issue of the STREET RAILWAY JOURNAL. The discussion of this paper was introduced by the reading of a letter from H. H. Polk, president of the Interurban Railway Company, Des Moines, Iowa, in which he expressed the opinion that no departure should be made from standard gage, because, if a road is to be a success in Illinois or Iowa, it must do a general railway business and interchange business by means of standard steam railroad freight cars.

Ernest Gonzenbach, of Sheboygan, Wis., sent in a written discussion. This referred to the trackless trolley experiments in Europe and to a proposition which came up in Ohio some time ago of building flat cars which would take farmers' wagons loaded with produce so that it would not be necessary to transfer produce from wagons to cars. He said that there was undoubtedly a crying need for some such class of railway as proposed by Mr. Cravath. It would appear to be but a short step for the manufacturers to build single-phase motors suited to 28-in. gage. The gage was certainly very narrow. The type of car proposed in the paper would probably cause the car builder to do some thinking, but no doubt it could be built. He suggested the use of a side-entrance car with seats running the full width of the car as giving a greater seating capacity and utilizing the room to better advantage. He thought it possible that a solution lay in the directions outlined in the paper. Mr. Cravath had estimated the passenger earnings per capita from the rural population too high, but on the other hand, had estimated the freight earnings from a rural territory of this kind too low.

W. Owen Thomas told of a number of examples of light railway construction he had seen in England. He cited one road costing about $9,000 per mile standard gage, operated with self-propelled steam dummy cars. Another road, 30-in. gage, costing $7,000 per mile, was operated with small locomotives. He expressed the opinion that for the class of territory in which the light railway of the kind proposed in the paper would be built, gasoline motor cars would be especially suited because of the long intervals between trains and the fact that with them no investment need be made in overhead line or power station. It was for this class of road that gasoline motor cars are better suited than for any other kind of railway service. The Chicago & Northwestern Railway Company, with which he is connected, had probably 100 small branch lines operated with one locomotive. It was a great problem among steam railroad men to know how to operate these small feeders economically. The light railway proposed by Mr. Cravath might develop a country so that it could be followed up later with a standard road. One thing that had prevented the building of more light railways in England was the great number of legal requirements in the way of expensive safety precautions. Such restrictions did not exist in this country.

George A. Damon, of the Arnold Company, said that in that company's office scarcely a day passed that they were not visited by somebody, an earnest business man or farmer, from some of the Western States wishing to build an electric road in some location where the ordinary electric interurban would be out of the question. There was a great demand for some kind of a road that could be built and operated cheaper than any now common. Mr. Cravath would not make a good promoter. His estimates were too conservative for that. He suggested some changes in the car proposed. So far, in electric railway building in this country, almost no account had been taken of depreciation, and he believed that this was right under the conditions which had prevailed, because, in the course of time, the appreciation had taken care of the depreciation. In other words, after a road had been built and operated for a number of years and was at the point where it was falling to pieces and must be rebuilt, it had developed such an increase in traffic and possible earnings that capital could be found to re-equip the road. In the case of such a road as proposed by Mr. Cravath, however, the depreciation could not be forgotten, for the following reasons: If a road was operated for a number of years until it had developed territory sufficiently to warrant the building of a standard gage road with heavy construction, it would not be worth much to the builders of the standard gage road, as the cars, rails and ties would be of no use for the standard gage, and the probability was that even the location of the grade would not be suited to a standard gage road on account of being so crooked. New capital coming into the field, therefore, to build a standard gage road would not purchase the old light railway as a basis of operations, but would build a new parallel road. Depreciation, therefore, must be considered. According to Mr. Cravath's figures, the enterprise as a financial proposition would be gone into simply as a 6 per cent investment by local parties interested in having better transportation facilities. It could not be considered as a speculative investment or as yielding big money to the promoter. He thought Mr. Cravath's figures on freight traffic were too low. He had some figures from a farming country showing twenty-five carloads of freight outgoing per square mile, and three loads ingoing, making in all twenty-eight carloads of freight per square mile per year. Summing up the whole proposition, he thought the figures given in the paper were well within reason; that such a road could probably be built for less than the figures given and would probably earn more than the figures given, which would make the financial statement even better and would make the building of such a road worth while. He hoped to see such a road built.

W. B. Potter, engineer of the railway department, General Electric Company, in a letter received after adjournment, said that from a manufacturer's standpoint there was no doubt that motors could be obtained of special horse-power for the work required within the dimensions imposed by the gage. Considering the proposition broadly, he questioned the advisability of anything other than standard gage. The ties, grading and bridges would be the only items affected with respect to cost. The saving in the use of standard motors as against special motors for the narrow gage would offset the difference in the cost of trucks. The increased cost per mile, he thought, could be safely estimated at $2,000 for the standard as against the narrow gage road. The ability to use existing tracks for standard gage rolling stock would have a bearing on the convenience and cost of operation. If such a railway as proposed proved a success, it would be far more saleable if the permanent way and bridges were constructed to standard gage requirements.

DISCUSSION ON HIGH-TENSION TROLLEY LINES AT CHICAGO

At a meeting of the Chicago branch of the American Institute of Electrical Engineers, May 23, there was a discussion of the paper on "Line Construction for High-Pressure Electric Railroads," by George A. Damon, and the paper on "High-Pressure Line Construction for Alternating-Current Railways," by Theodore Varney. Mr. Damon, of Chicago, abstracted both these papers, which were printed in part in the Street Railway Journal of April 1, 1905. The stereopticon views used by C. O. Mailloux, which were presented in the discussion of these papers in New York, and published in the Street Railway Journal of April 8, 1905, were shown by Mr. Damon. Mr. Damon supplemented his paper by a few remarks regarding recent estimates and tentative plans made by the Arnold Company in connection with the electrical equipment of steam roads. He said that in figuring on the electrical equipment of the Port Huron tunnel of the Grand Trunk Railway under the St. Clair River, they had concluded that the double catenary construction shown by Mr. Varney in his paper would be too complicated for use in railroad yards. In another case upon which they were figuring, namely, the equipment of over 100 miles of steam railroad in Canada, the cost of the double catenary was prohibitive.

Local Secretary Junkersfeld, who presided at the meeting, introduced the discussion by referring to the prominent part Chicago men had played in the development of high-tension trolley construction, Messrs. Arnold and Damon having done pioneer work in that direction, and the overhead construction of the first commercial single-phase electric road, the Indianapolis & Cincinnati Traction Company, having been also largely designed by Chicago men. Regarding this latter work, he would ask Fay Woodmansee, of Sargent & Lundy, to make a few statements.

Mr. Woodmansee said that the Indianapolis & Cincinnati Traction Company had operated its high-tension trolley line now since Jan. 1, and it had proved very satisfactory. In the preliminary calculations it had been determined that any trolley voltage under 3300 would not make possible any material saving by the use of the alternating-current motor. The voltage had therefore been placed at 3300. The policy had been to place the sub-stations rather close together, feeding sections of trolley wire from 10 miles to 12 miles in length. The current generated was three-phase, as three-phase generators had been ordered before the alternating-current motor was adopted. In each sub-station the transformer secondaries were connected to give two-phase current, one phase feeding the trolley in one direction, and the other phase in the other direction from the sub-station. This plan was adopted because of the convenience of transformation and the desirability of having different sections of trolley wire in different phase on account of the inductive effect on telephone lines. There were no automatic circuit breakers in sub-stations. The sub-stations were intended to be operated without attendants and had two banks of transformers, so that one bank could be cut out for inspection or repairs, leaving the other in service. Before the alternating-current motor came up, the third rail had been decided upon for this road because of the high speeds which were considered necessary. The details of the line construction of this road were worked up by B. J. Jones, and much of it was shown in Mr. Varney's paper.

Mr. Jones was called upon, but said that Mr. Varney's paper covered the ground, and he had nothing to add regarding the construction.

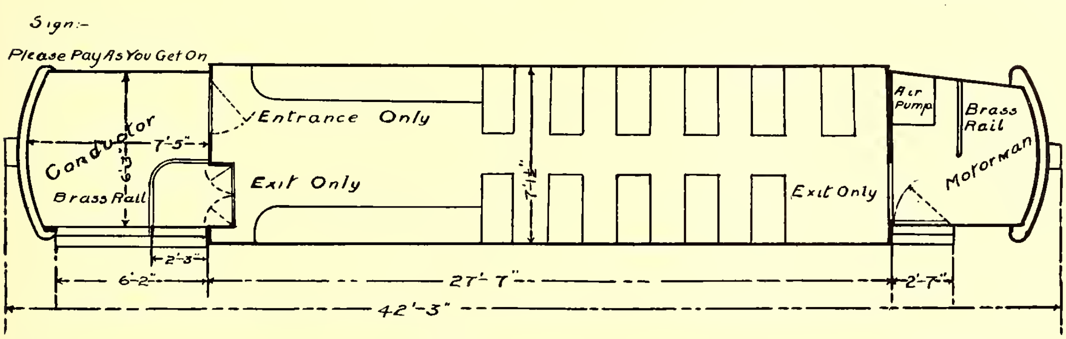
Fred L. Lucas, general manager of the Bloomington, Pontiac & Joliet single-phase road, reported satisfactory operation of the high-tension trolley of that road. The plan originally called for supporting the trolley wire from the catenary every 10 ft. Such frequent supports had not been put up yet, on account of the lack of material, and at present the supports were midway between each pole. He was beginning to question whether such frequent supports of the trolley wire from the catenary would work well with the ordinary form of trolley wheel because of the slight jumping of the wheel at each mechanical clip. With these placed every 10 ft., he thought there would be considerable sparking at the wheel. The drop in voltage in the rail return was less than had been expected, and would indicate that our data on the apparent resistance of track with 25-cycle alternating current would need some revision.

J. R. Cravath said there had been some disquieting rumors afloat the past few months as to the effect of single-phase trolley wires on neighboring telephone lines, and he asked Mr. Woodmansee as to the experience on the Indianapolis & Cincinnati.

Mr. Woodmansee said that there was no trouble in the use of the telephone in ordinary weather, and only a slight humming on wet days. They had taken the precautions to insulate the telephone lines better than usual, and the telephone wires were placed on porcelain insulators.

THE MONTREAL STREET RAILWAY COMPANY'S NEW CAR

Since the publication of the article on the Montreal Street Railway Company's new divided platform car in the STREET RAILWAY JOURNAL of May 20, further details have come to



PLAN OF DIVIDED PLATFORM CAR USED BY THE MONTREAL STREET RAILWAY

hand which present additional advantages of this construction.

As will be noted from the accompanying plan view, the back platform can accommodate twenty-five to thirty passengers instead of fourteen, as mentioned in the first article. Perhaps one of the best features of this car is that since the passenger must pay his fare upon entering the gate there is no occasion for quarreling with the conductor as to whether or not fare was paid; nor is the passenger annoyed by the movements of the conductor in any way. It will be noted that the entrance has a sign reading: "Please pay as you get on."

This interesting car is the joint design of the company's managing director, W. P. Ross, and manager, Duncan McDonald, who have already secured patent rights for the same.

ADDITIONAL SAFEGUARDS

The New Orleans Railways Company has provided its Esplanade and Canal Belt cars with additional safeguards against accidents resulting from passengers leaning from the windows. Heavy wire screens have been placed along the cars near the window sills, and above these screens are the small iron bars. The rods have been raised higher than heretofore to prevent passengers putting their elbows or arms out of the window.

The close proximity of trees along the neutral ground of Esplanade and Canal Avenues has rendered these extra precautions against accident necessary.

ELECTRIC FREIGHT IN MICHIGAN

The Detroit, Ypsilanti, Ann Arbor & Jackson Electric Railway has established a general freight service, handling goods in carload lots. For that purpose specially designed motors were constructed and flat cars built, all equipped with air brakes. The trains are made up of a motor car and four trailers. So far no attempt has been made to bring this traffic into Detroit proper. The start, however, was made a few days ago, when a train of four cars went out of one of the west end brick yards. Each car carried 40 tons of bricks. These were taken to Kalamazoo. Contracts have already been made by the Detroit, Ypsilanti, Ann Arbor & Jackson to handle between 4,500,000 and 5,000,000 brick this summer to such places as Ypsilanti, Ann Arbor, Jackson, Kalamazoo and Battle Creek.

NEW YORK CENTRAL AND ROCHESTER RAILWAY ARRANGE FOR INTERCHANGEABLE TICKETS

An arrangement has been made between the Rochester Railway Company and the New York Central by which traffic between Rochester and Ontario Beach this summer will be handled by tickets which will be interchangeable on both roads. The tickets purchased for a ride to Charlotte on the trolley line will also permit passengers to enter Ontario Beach Park, and then if they so choose they may return home by the steam railroad. The order of the trip may be reversed if desired, and passengers may ride back on the electric railway after having gone by the steam road. The trolley tickets admitting holders to the park at Ontario Beach, and permitting them to return to the city either by the New York Central or by the trolley line are to be sold for 30 cents, an advance of 5 cents on the old rate to Charlotte and return. The tickets are to include a coupon good for one ride on the city lines of the Rochester Railway Company, which may be used whether the holder comes back by trolley or by the steam road.

Officers of the Long Island Railroad and a number of city officials made a test of the new electrical equipment on the Rockaway division of the Long Island Railroad, between Aqueduct and Hammells, over the Jamaica Bay, on Thursday last. All the third rails for Atlantic Avenue and the Rockaway divisions have been laid except about a mile on Atlantic Avenue, between Aitken Avenue and the Brooklyn line, and it is expected to put the system in operation by June 15 on the lines above named.

ELECTRIC PARK, NEWARK, N. J,

The past three or four years have witnessed a remarkable development of the "Midway" type of park in and near a number of American cities where natural attractions are scarce, and where the majority of the public prefers pleasures not offered by Nature. In parks of this character it is customary to charge a small entrance fee, which covers admission to the grounds and to some of the attractions operated by the park management, while a separate charge is made for each of the shows run by concessionaires. The layout of the various amusement structures and the lighting arrangement also come under the park management, as well as the selection of the attractions that are likely to prove most popular with the local people. Too much stress cannot be laid upon the last point, for there is sometimes a tendency on the part of park managers to follow the dictates of their own tastes, or to install exhibitions merely because they have proven profitable in another locality. A park that seeks the patronage of the working class is not likely to succeed by the presentation of light operas, and if the company desires to cater to a more refined class, boisterous variety will prove a failure.

THE ILLUMINATED ENTRANCE TO ELECTRIC PARK

Past issues of this paper have contained descriptions of rural parks, and it will undoubtedly be of interest to present particulars of a recent pleasure ground which is successfully serving a cosmopolitan population, besides being an important factor in the earnings of the local traction company. A good example of this class of resort is offered by Electric Park, Newark, N. J. This park covers an area of 10 acres on South Orange Avenue, adjoining the noted Vailsburg bicycle track, and is within less than half an hour's ride from the heart of Newark. The total population drawn upon is about 500,000, and for the greater part consists of working people who cannot afford to pay for anything elaborate, but want to visit a park where they can have a good time for little money. As Electric Park has become so popular with this class, it may be of value to consider the methods that the management follows to secure an attendance of over half a million in one summer season.

This enterprise is owned by the Electric Park Amusement Company, and is under the direction of C. A. Dunlap, the president and general manager of the company. As the grounds are ample in extent, the buildings are not crowded too closely, so that the park is able to handle many thousands of people without congestion. As to attractions, Mr. Dunlap believes that as far as night entertainment is concerned, there is nothing better than artistic and liberal illumination. Years ago Mr. Dunlap designed a number of elaborate electric fountains, and, although this feature is no longer a novelty, it is still very popular, so much so that after the fountain installed in Electric Park ceases playing, half the people leave the grounds for home. Of course, this park affords many other amusements besides this, but there is no doubt that much of its popularity is due to the liberal use of electric current. Last year part of the power was generated in an isolated plant owned by the company, but this season all of it is purchased on favorable terms from the Public Service Corporation, whose railway lines carry the park visitors. The management does not believe that a park management should put in its own plant unless more than 1500 lamps are to be used, and not even then if low terms can be secured from the local power company.

The general admission to the grounds is 10 cents, this including free admission to the theater, open-air circus and spectacular productions like the electric fountain, fireworks bombardments, Hawaiian dancing girls, etc. When the theater was originally opened all seats were free, but many visitors expressed their dissatisfaction at being frequently annoyed by the waiters. To overcome this objection the management arranged to reserve a section from which all drinking tables were removed, but in which a charge of 10 cents would be made per seat. This innovation proved very successful, as many people were willing to pay the extra fee in order to be free from disturbance. The entertainment offered is variety, a four-week experiment with light operas having convinced the management that its clientele did not care for the latter style of entertainment. The introduction of the reserved seats netted over $6,000 in one season, and only one extra employee, a ticket seller, was required.

A very popular feature of this park is the dance hall, which did such good business last year that it has been found necessary to enlarge it to 175 ft. x 50 ft. The structure is furnished with removable sides to make it available for both cool and warm weather. At the sides of the dance hall there are also a number of chairs and tables for serving refreshments. The charges for admission to this hall are 15 cents for gentlemen and 10 cents for ladies.

Among some of the old but ever-popular standbys to be found here are bowling alleys, pool tables and a splendid $15,000 carousel. Besides these there are a number of modern amusements like the figure-eight roller coaster, old mill, laughing gallery, penny arcade, etc. An amusing but inexpensive novelty originated by the management calls for the employment of a tank of water, a hammock and a jolly negro. The hammock is hung in such a way that when a baseball is thrown with sufficient force against a certain disc the hammock fastenings are loosened and the negro falls into the water, much to the amusement of the onlookers. For this season the park management is installing quite a number of more elaborate attractions, such as the circle swing; a working model of the


ONE OF THE JAPANESE BUILDINGS UNDER CONSTRUCTION

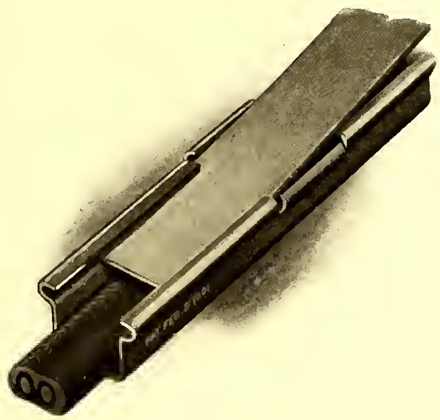
famous Strasburg clock; a miniature railway, which will pass through a short tunnel and transport visitors from show to show about the grounds; a gypsy camp; a Mexican village, and a Japanese village, which should prove a good drawing card in view of the public's great interest in all matters pertaining to the "land of the rising sun." An important factor in the profits derived from the concessions is that for the various refreshment stands. For instance, last season the proprietor of the sausage stand paid a rental of $800, and the owner of the popcorn stand $1,000.

As there is no lake on the present grounds, it is not possible to have a chute-the-chutes or give aquatic performances. It is planned, however, to take care of this in the new park which is to be laid out by an affiliated company on the site of the adjoining bicycle track.

As noted before, Electric Park is in no way connected with the local railway company, the function of the latter being simply the plain and profitable business of transporting passengers to and from the park gates. Mr. Dunlap's experience in the amusement field has convinced him that it is not good policy for a railway company to operate its own parks, unless the attractions offered require practically no maintenance expense, as is the case where the drawing power of a picnic ground depends on its natural features and nothing else is offered outside of a baseball ground, carousel, etc. The park business is as much a profession as the management of an electric railway, and the best results are obtainable only under a manager who is a specialist in this work, knowing not only how to cater to the tastes of the majority, but also where to secure the right attractions on the most favorable terms. The development of Electric Park is therefore typical of what can be done when a pleasure ground is treated as a distinct business proposition by men who have the training to make it a source of considerable revenue, irrespective of the profits derived from transportation.

METALDUCT

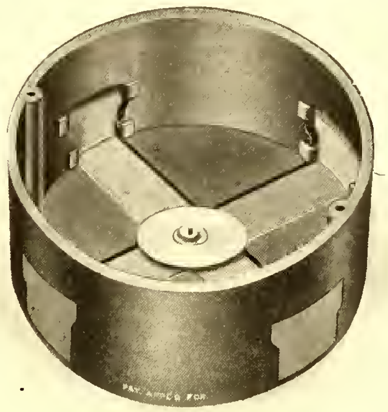
A metal molding, known as "Metalduct," has recently been placed on the market by Sibley & Pitman, of New York. It is a steel duct of proper dimensions to carry two or three wires, as may be required. Countersunk portions are provided in the bottom of the duct to receive screws or nails readily, so that the fastening of metalduct to walls or ceilings requires less



METAL MOLDING CARRYING TWO WIRES

time and exertion than even wood molding. The cover is of flat flexible steel, made to slide into the two grooves of the duct, thus serving to thoroughly enclose and support the wires. The cover can be removed at either end of the duct, or at any point desired, by making two hack-saw cuts about 1 in. apart through exterior flanges of the duct and slightly opening the cut portion to release the end of the capping. It is furnished ordinarily in lengths of 10 ft., and each length can be fastened or bonded to another length by a bond.

The method of applying the bond is exceedingly simple. A slot is cut with an ordinary hack-saw in the bottom of the duct ½ in. from the end, prongs of bond are inserted in slot, bond is snapped over the exterior flanges of the duct, prongs are bent down, and the joint is made. The elbows are made in two forms, one the rigid 90-deg. style, the other an adjustable elbow, which can be bent to any obtuse angle and yet maintain a perfect enclosed conduit with rounded corner to prevent abrasion of the insulation of the wires. Outlet boxes are of the



OUTLET BOX

knockout type, made for four or less outlets. The outlet bonds are fastened by a single screw in the center of the box, and by having ends bent in rounded shape do not require metal bushings. Other appliances, such as rosettes, receptacles, corner angles, etc., are also furnished; in fact, everything to make the system complete in every detail.

The first expense is much less than that of any conduit pipe in the market, and, figuring the cost of labor, a very little more than wood molding, besides decreasing the danger from fire to a minimum.

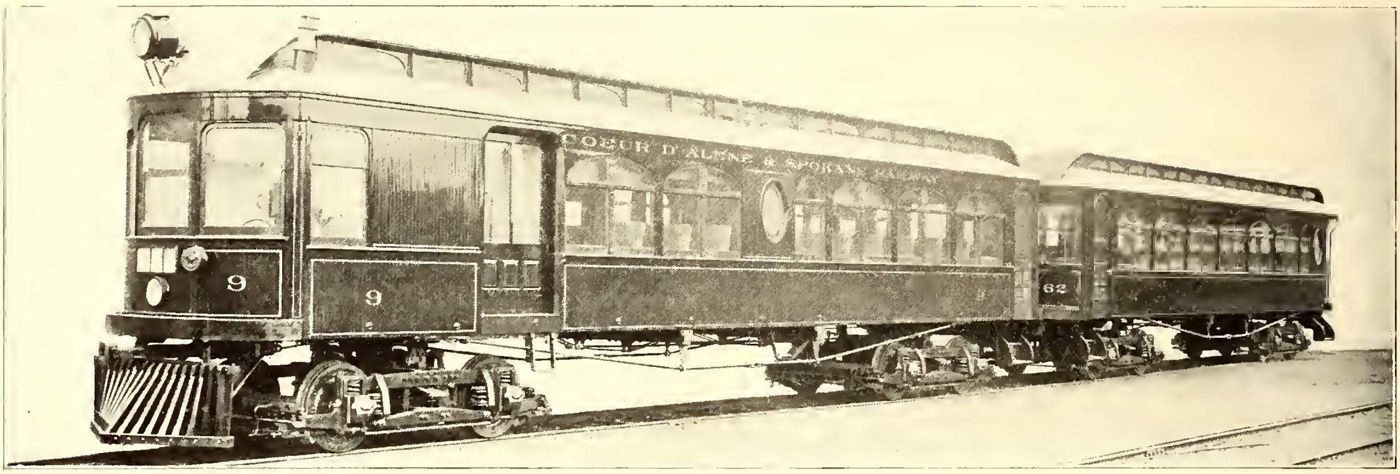
A DIRECT-CURRENT POLYPHASE ROAD FOR AUSTRIA

The most important electric railway now projected in Austria is a proposed road from Vienna to Pressburg. The line is about 47 miles in length and extends along the right-hand bank of the Danube. The construction of this railway has recently been assured by the guarantee by the province of Lower Austria of 4 per cent interest on the company's debentures, amounting to 10,500,000kr. The capital stock of the company is $15,000,000. The line will be constructed on the combined d. c. and three-phase system of Ganz & Company, of Buda-Pest. Originally the road was planned to be built three-phase, but as all the cars have to pass over the d. c. tramway systems in the terminal cities of Vienna and Pressburg, the combined system had to be adopted. It is the same for which bids were accepted by the London, Ontario & Port Stanley Railway in Canada.

According to this system motors will be used which can operate with either direct current at 500 volts or three-phase current at 3000 volts. The motor cars will be equipped with four motors each, and their normal speed will be about 56 m.p.h. When running three-phase the motors will be operated with cascade control, when on the d. c. system, with series-parallel control. Each motor car will draw two trail cars. The line will carry freight, for which purpose five electric locomotives with a normal speed of about 30 m.p.h. will be provided. The power station will be erected at the middle of the line and will be equipped with steam turbines.

INTERURBAN CARS FOR THE COEUR D'ALENE & SPOKANE RAILWAY

The Cœur d'Alene & Spokane Railway has quite recently received four large interurban cars built by the J. G. Brill Company. The cars will be operated on the company's interurban line of about 35 miles, connecting Cœur d'Alene and Spokane, Wash. The road traverses the valley of the Spokane River, which has its source in the Cœur d'Alene Lake, in which vicinity is the richest mining district in the State. Spokane is the nearest large commercial center. The business of the company is steadily growing and new equipment has frequently



MOTOR AND TRAILER FOR THE CŒUR D'ALENE & SPOKANE RAILWAY

been added, all of which has been furnished by the American Car Company and the J. G. Brill Company. Two of the new cars are combination passenger, smoking and baggage motor cars, and the other two are trailers.

The combination cars are 51 ft. over the crown pieces, and 8 ft. 8 ins. wide. Cowcatchers are used, and the roof follows steam car practice. While the semi-convertible window system is applicable to the arched-top twin-window arrangement, only part of it is used in this case—that is, the lower sash when raised are partly contained in the side roof, the bottom of the

INTERIOR VIEW SHOWING SPRING CANE SEATS

INTERIOR OF TRAIL CAR

lower sash being equally as high as the bottom of the small stationary upper sash. The seats in the smoking and passenger compartments are of spring cane, while the baggage compartment has a seat of cherry slats on each side. The sliding doors of the baggage compartment on each side of car are 40 ins. wide, and the door in the partition between the baggage compartment and the motorman's compartment is 24 ins. wide. In the center of the car is a small toilet compartment.

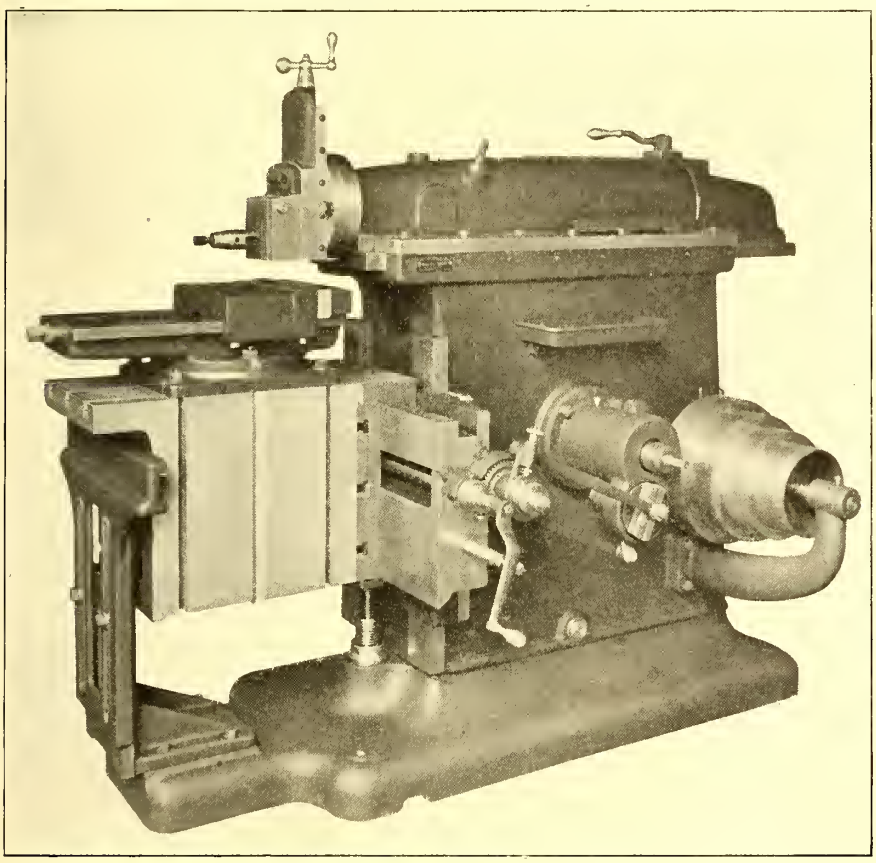
The trailers are 48 ft. 9 ins. over the crown pieces, and 8 ft. 8 ins. wide. The window system is the same as in the cars above described. Entrances are provided at both ends. The seats are upholstered in plush, and are arranged to accommodate fifty-two passengers. Motors may be installed at any time, in which case these cars may serve as an ordinary type.

The bronze rail that drops to guard and hold open the vestibule doors closing the step openings, also acts as a hand rail, and is similar to those used on Pullman cars. The bottom framing is unusually substantial, and consists of double side sills, the outer 4 ins. x 8⅜ ins., and the inner 2 ins. x 6 ins., with a 15-in. x ⅜-in. steel plate sandwiched between. The four center sills are composed of 6-in. I-beams, with yellow pine fillers. The truss rods under the side sills are 1½ ins. in diameter, and the needle beams are double trussed. The floors are double and have ⅛-in. felt between. The interiors are pleasingly finished in golden oak.

The general dimensions of the cars are as follows: Motor car—Length over the end panels, 46 ft. 1¾ ins., and over the bumpers, 52 ft.; length of the passenger compartment, 22 ft. 8 ins.; of the smoking compartment, 10 ft. 8 ins., and of the baggage compartment, 8 ft. 4¼ ins. From the end panel over the crown piece is 4 ft. 11 ins. The thickness of the corner posts is 3¾ ins., and of the side posts, 3¼ ins. The side sill size is 4 ins. x 8¾ ins., and the end sill size, 6 ins. x 8 ins. The sill plates are 12 ins. x ⅜ in. The weight of the car and the trucks, without the electrical equipment, is 49,600 lbs. The trailers are 38 ft. 10 ins. over the end panels, and 49 ft. 9 ins. over the bumpers. The other dimensions are exactly like the foregoing. The No. 27-E-2 trucks have a wheel base of 6 ft. 6 ins. and 33-in. wheels.

A NEW TWENTY-FOUR INCH SHAPER

The shaper illustrated herewith is an interesting new design of a metal-working shaper that has recently been placed on the market by the Queen City Machine Tool Shaper Company, of Cincinnati, Ohio, which is interesting for many important features which have been incorporated in the construction. This company has not previously built a shaper in this size, having confined its productions to the smaller sizes with great success. The demand for the larger size of tool which has been felt, however, is now to be met by the new design of the 24-in. shaper, which is strong enough to take care of work



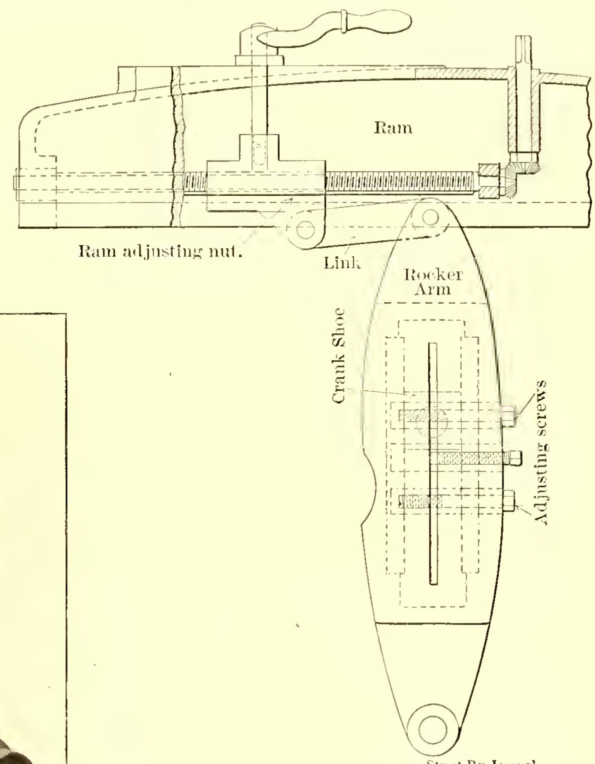
24-IN. METAL-WORKING SHAPER

that would ordinarily be considered only in the range of shapers of much greater capacity. This tool will be of particular interest to electric railway shop men.

As may be noted from the illustration, the shaper is of a very substantial design, the column and the ram being of very generous proportions. The bearing for the ram is 11 ins. x 40 ins. in size, and sufficient overhang is provided at the top of the column to give the tool ample rigidity when working at long stroke. The ram is of an arch shape, which assists in maintaining rigidity at the cutting tool when in extreme positions. The table is also very heavily built, having a cross traverse of 30 ins., and has a strong and rigid outer or knee support, which is capable of adjustments to all positions of the table and still permits of free cross travel of the table. The vertical adjustment of the table is made through a telescoping screw beneath the cross rail, which is operated through bevel gears by a handle at one end of the rail.

All column bearings are extra long and are bronze bushed, thus providing for the maintenance of the original centers in case of renewal of bearing bushings. The pinions and bevel gears, as well as also the vise-jaw plates, are of steel. The vise is of the planer type with swivel bed.

The ram adjustment has interesting features, which are illustrated in a drawing herewith. The position of the ram relative to the rocker arm is easily controlled from a point outside by means of a hand crank, as indicated in the drawing; upon loosening the clamp shown, the ram may be moved forward or



RAM ADJUSTMENT OF SHAPER

backward relative to the rocker arm and clamped by the mere turning of the projecting lug at the top. The rocker arm is split and provided with adjusting screws, by means of which any wear in the crank shoe guides may be easily taken up. The arm is in this shaper different from usual construction, in that it is of solid construction with a through opening merely in the form of a sewed slot for the above adjustment.

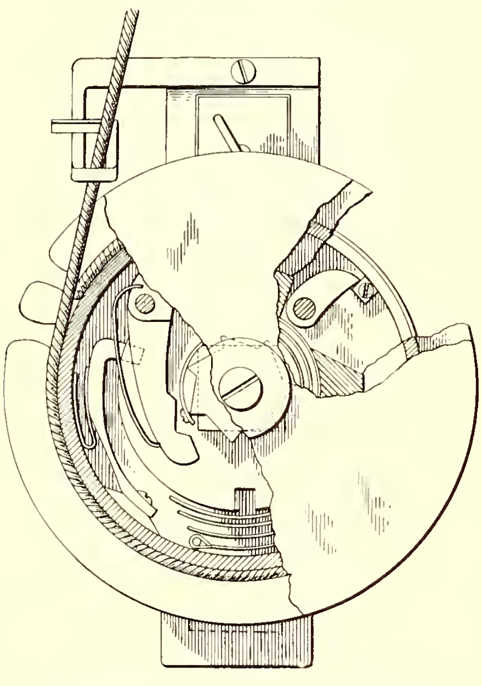
Although the machine is not shown with a down-feed attachment, still one is furnished if desired, as may also be the concave attachment, a tilting and revolving table, etc. The ratio of back gear in this machine is 29:1, so that it is sufficiently heavily powered for the modern requirements of the high-speed tool steels. The principal dimensions are as follows:

SPECIFICATIONS OF THE 24-IN. BACK-GEARED QUEEN CITY SHAPER

Actual length of stroke	25	ins.
Vertical traverse of table	15	"
Cross traverse of table	30	"
Greatest distance ram to table	17	"
Diameter of head	9½	"
Feed to head	7½	"
Top of table	27x14	"
Side of table	27x17	"
Length of ram bearing in column	40	"
Width of ram bearing in column	11	"
Key seating capacity up to	3¾	"
Vise jaws	14x2½	"
Vise opens	13	"
Number of speeds to ram	8	
Revolutions per minute of countershaft	330	
Net weight of machine and countershaft	4400 lbs.	

COMBINED TROLLEY CATCHER AND RETRIEVER

The accompanying description and illustration relate to a combined trolley catcher and retriever which has been designed recently by Henry M. Love, of Utica, N. Y. The retriever may be provided with a beveled lug at each end to fit into a block adapted for bolting to the dashboard. The upper lug is provided with a turnbuckle for easily carrying the device, and also has a strap by which the apparatus is secured in the block. On the center of the base is mounted a shaft with a central ring and outer circular strip beveled on the exterior to keep out weather. The shaft has mounted thereon a hollow core and sleeve, the two being intended to turn together. The inner edge of the core, at its other end, rides on the edge of the central ring, and this latter end of the core rests also on the face of the base, but is partly cut away to provide for the pivotal mounting thereon of three dogs. Stops and supports are provided on the core for the dogs which may thus fall inward against the supports, but are blocked by the stops when thrown outward by the sudden turning of the core. There is a block on the base, shown as a set screw, located so as to engage one of the dogs and stop the core when it is quickly turned and the dogs thrown out by centrifugal force, while under a slow revolution the dogs drop down without engaging the block.



PART SECTION OF TROLLEY CATCHER AND RETRIEVER

Around the core and opposite the drum is a straight groove, which, when the drum is revolved, permits the free travel in one direction of a spring dog, but has a step at the bottom to divert this dog into a side pocket when it travels in the opposite direction. Inside the core is a spring secured at one end on the shaft and at the other on the core, its purpose being to keep the slack out of the trolley rope. The second spring, which acts as a retriever, has one end mounted on the drum and the other on the sleeve.

The operation of the complete device takes place as follows: Several turns of the trolley rope are taken about the drum. The rope is then pulled up slowly to put the core or catcher spring under enough tension to turn the drum and core and keep the slack out of the rope. In doing this, the dogs drop by gravity out of the way of the set screw block. A quick pull is then given to the rope, which throws the dogs outward, one of them engaging the block and holding the core. Further pull on the rope winds up the retriever spring, which is put under sufficient tension to overcome that exerted by the trolley base spring; the end of the spring dog is brought to rest in the side groove pocket, locking the drum and the core together so that they will both turn by the force of the core spring to wind the slack of the trolley rope. The latter need not be of any exact length, and turns can be put on and off of the drum if necessary to bring the trolley wheel to the wire under the required tension of each spring.

When the pole jumps the wire, the rope turns the drum a short distance to the right, the momentum overcoming, for the instant, the tension of the retriever spring, or the turning of the drum and core together throws a dog against the block and suddenly locks the inner end of the retrieving spring. This forces the spring dog out of the pocket into the straight groove on the core, at which time the retriever spring acts and turns the drum to the left and pulls back the pole. The sudden movement has locked the core so that the retrieving spring can act to wind the rope.

When the retriever spring has overcome the tension of the trolley base spring, it is only necessary to pull out the rope as before to set it to the proper tension. The core spring tension remains the same, or will be when the same number of turns as before have been taken in the retriever spring.

This device may be variously modified to permit the dog, cover and drum to revolve freely when retrieving, but not when moving in the opposite direction, namely, that the recoil of the trolley base spring and the retriever spring also will be retarded and vibration of the pole prevented. In case it is desired to use the device simply as a trolley catcher, the drum and core can be fastened together by slipping the spring dog into a side pocket, or by other suitable means. Should it be desired to use the device only as a retriever, the core can be held fast by taking several turns of the core and drum to the left and letting go suddenly, which will throw one of the dogs against the set screw block with the core spring in such position as to hold the core, or a pin may be passed through holes provided in the core and base to hold the two parts together.

The diameter of the drum is about 6 ins., and the weight of the device will be about 10 lbs. A feature is that the parts are comparatively few and can be readily assembled or replaced.

A NEW COMMUTATOR TRUING DEVICE

Jordan Brothers, of New York, have recently developed a commutator truing device which can be applied to the machine while it is running, thereby avoiding the necessity of removing the armature of the machine or even shutting it down from its regular duty. In brief, it consists of a grinding wheel in adjustable ball bearings and equipped with appropriate clamps, whereby it can be fastened to the rocker arm or the motor frame. The device is illustrated in Fig. 1, and its operation is as follows:

The truing tool is bolted in position so that its shaft is parallel to the dynamo shaft and the grinding wheel just clears the commutator. A round belt passes around a driving pulley on the grinding wheel shaft, and from there around the end of the commutator or any convenient adjacent revolving portion of the machine. An idler is provided on the truing device to take up any slack in the belt and to give proper adhesion. The grinding wheel shaft is movable parallel to the commutator, and has sufficient range so that it can be fed across the entire length of the commutator bar. This shaft is set in an eccentric sleeve, and by the manipulation of the wing nut the wheel can be approached nearer the center of the commutator, thereby taking off as light a cut as may be desired.

The machine is set in motion by placing the belt in position and taking up the slack with the idler. The grinding shaft is then lowered by the eccentric sleeve to take off the proper cut, and the grinding wheel slowly fed across the commutator by the hand wheel shown in the figure.

It will be seen that the commutator is thereby trued with reference to its true center of rotation, which may or may not correspond with the centering marks in the ends of the shaft, and in this respect the device does a truer job than if the commutator were turned in a lathe.

The wheel used is of a special composition, and contains no emery or other mineral matter which would injure the insulation between commutator segments. The cut which the wheel makes is peculiarly clean and satisfactorily cut, there being no tendency to drag the copper across from segment to segment. When the job is complete, every segment will show the full width of the mica between bars. It is well known that it is very difficult to do a good job where a commutator is insulated

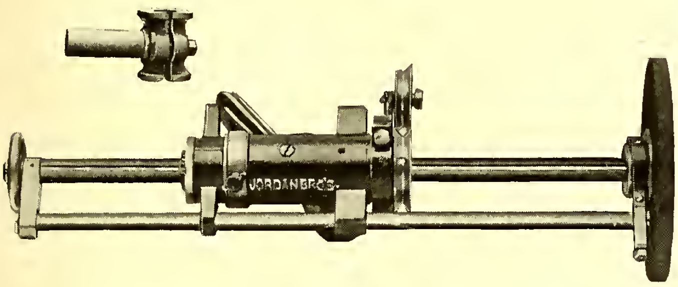


FIG. 1.—DETAILS OF COMMUTATOR TRUING DEVICE

with hard India mica, on account of the action of the mica on the tool, no tool point being able to resist it.

The Jordan commutator grinding device grinds down both copper and mica alike to the same height, and the commutator is as true when the work is complete as if it were turned in a lathe out of one piece of metal.

The device is thoroughly well made; the shaft re-

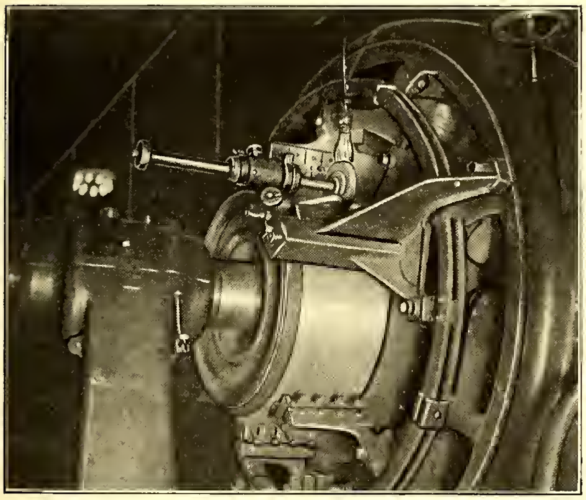


FIG. 2.—POSITION OF THE TRUING DEVICE IN SERVICE ON A RUNNING MACHINE

volves in a brass bushing having a hard steel cup at each end, and is equipped with ball bearings, causing minimum friction and wear. All of the parts are standard and interchangeable. Fig. 2 shows the device in operation truing a Westinghouse commutator while the electrical machine is still operating.

This device should be much appreciated by those who have large dynamos, as the labor of dismounting a large machine and the loss of its service are so great that a single commutator truing operation by ordinary means would pay for the instrument.

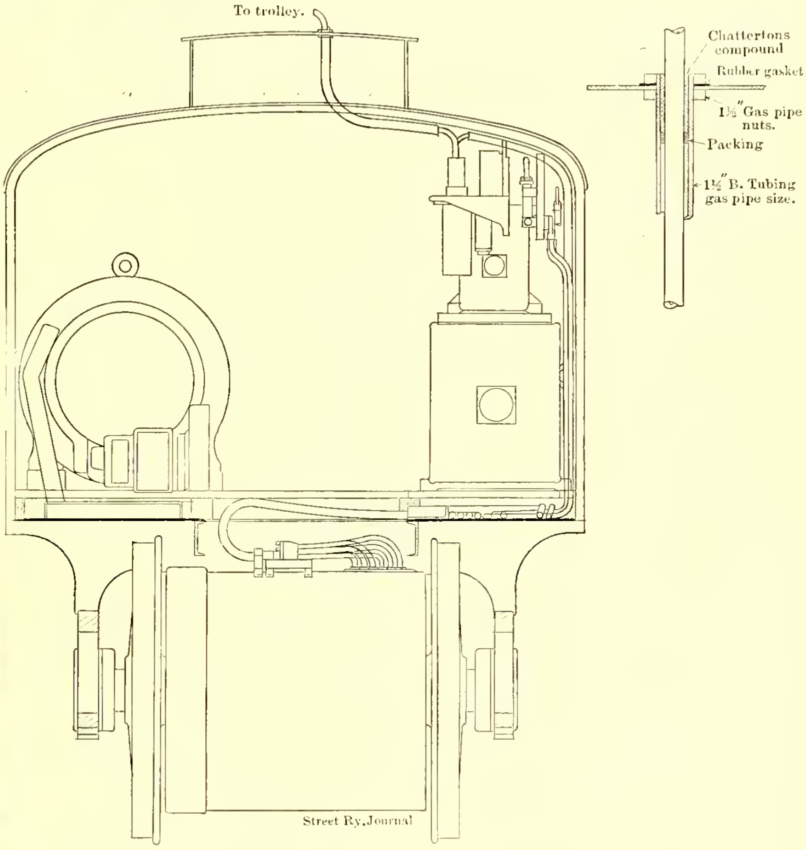
LIMITED SERVICE IN OHIO

The Northern Ohio Traction Company and the Canton-Akron Railway Company are working out schedules for the running of limited cars from Cleveland to Akron and Canton over the two roads mentioned. The present running time with a change of cars at Akron is three and one-half hours, and it is figured that at least an hour can be cut from this schedule.

SINGLE-PHASE LOCOMOTIVE FOR HEAVY RAILROAD SERVICE

A few particulars were given in the May 20 issue of this paper on the new Westinghouse-Baldwin single-phase electric locomotive which has recently been put in operation on the Interworks Railways at East Pittsburg, and was exhibited there May 16, during the visit of the International Railway delegates. This locomotive was built by the manufacturers to convince the railway managers of the world of the possibilities and advantages of the use of single-phase current for heavy electric traction, and to demonstrate in the most convincing manner possible the ability of the company to supply the necessary apparatus. It was shown in operation first running light and then hauling a train of fifty new steel gondola cars, weighing approximately 1200 tons.

A number of new features are embodied in the construction of this machine. It is, for instance, the largest alternating-current locomotive in the world, the largest to be operated by



CROSS SECTION OF CAR, SHOWING ARRANGEMENT OF APPARATUS

single-phase current, and it is equipped with six of the largest single-phase motors ever built. It is the first single-phase locomotive for use in America, and is designed for the highest trolley voltage ever used in this country. This locomotive is also the largest ever operated by means of overhead trolleys, is the first on which forced ventilation is used in the motors, and is unique in many other similar ways.

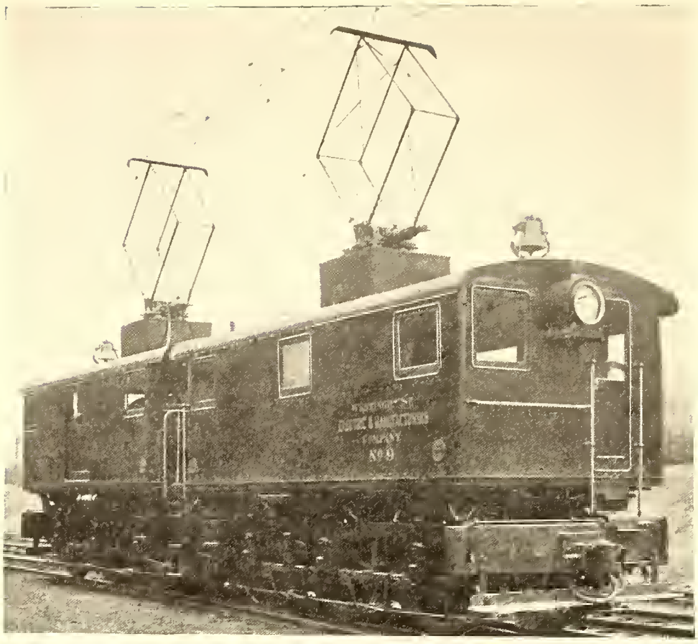
As described in the May 20 issue, this locomotive is built in two halves, each having one six-wheel truck with rigid wheel base. The drivers are 60 ins. in diameter and are mounted on 8-in. axles, with 6 ft. 4 ins. between centers. The side frames of the truck are of cast steel and are spring supported in the usual manner, the weight on the two inside axles of each truck being equalized. The cabs are built of sheet steel with angle-iron supports, and the entire cab as a whole is removable from the truck.

Each axle carries a 225-hp single-phase series motor, one side of which is supported directly on the axle, while the other is suspended by spiral springs from the locomotive body. The gear ratio is 18:95. The motors are of the same general construction as the standard Westinghouse alternating-current railway motors of smaller size, which have been previously described in these columns. They are so arranged that forced ventilation may be used and increased output thus secured.

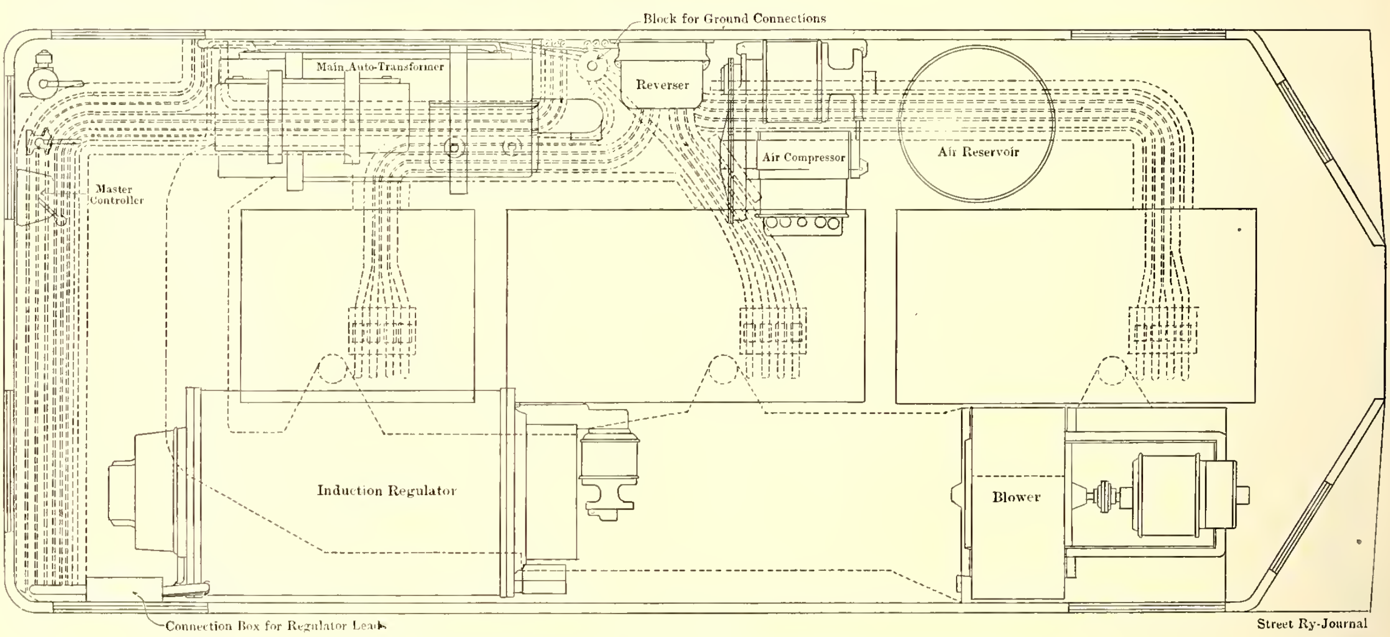
The locomotive is designed for a current of 25 cycles and a trolley voltage of 6600, and one of the most striking points of the exhibition to those who have been accustomed to the enormous currents required in heavy direct-current traction work was the sight of so large a locomotive accelerating a 1200-ton train over a third of a mile in length and receiving its entire power supply from a single No. 000 trolley wire.

The 6600-volt current is collected from the trolley wire by a pneumatically-operated pantagraph trolley on each half of the locomotive, and is carried through a suitable oil switch and circuit breaker to an auto-transformer in each cab. These transformers reduce the voltage to 325 for use at the motors. The trolleys may be raised or lowered from the cab by a suitable air valve.

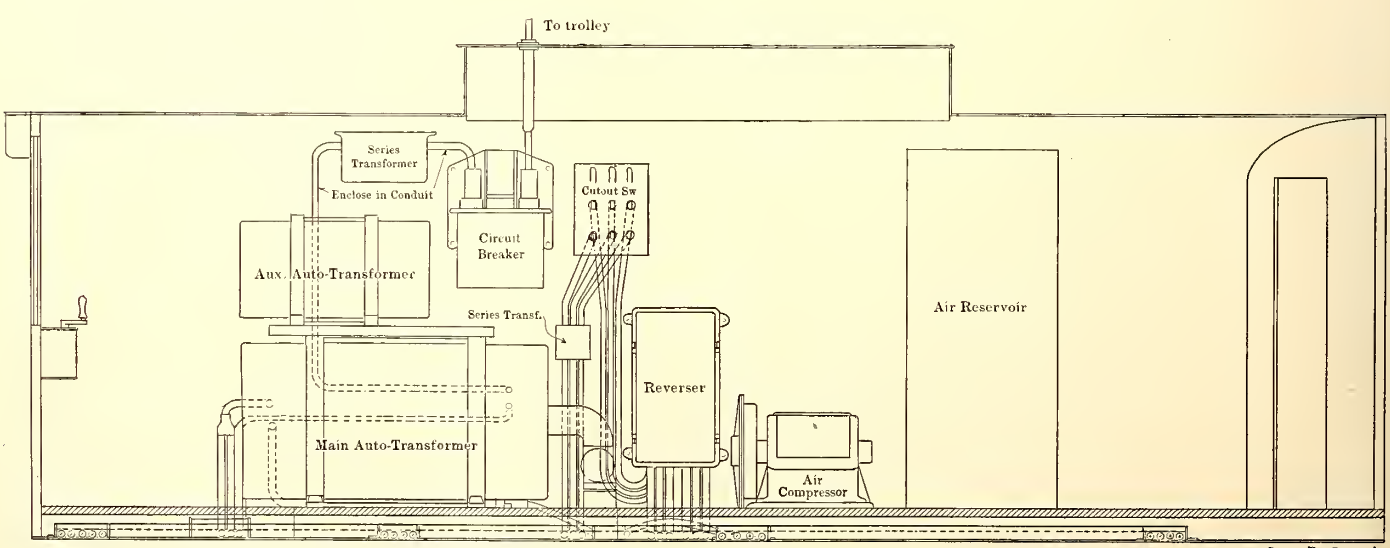
The three motors on each half of the locomotive are connected permanently in parallel, and are controlled by means of an induction regulator, which, under the direction of the operator, varies the voltage at the motors from about 140 to 325.



HEAVY-SERVICE ELECTRIC LOCOMOTIVE WITH DIAMOND BOW TROLLEYS



PLAN OF LOCOMOTIVE, SHOWING ARRANGEMENT OF APPARATUS



LONGITUDINAL SECTION OF LOCOMOTIVE, SHOWING ARRANGEMENT OF APPARATUS

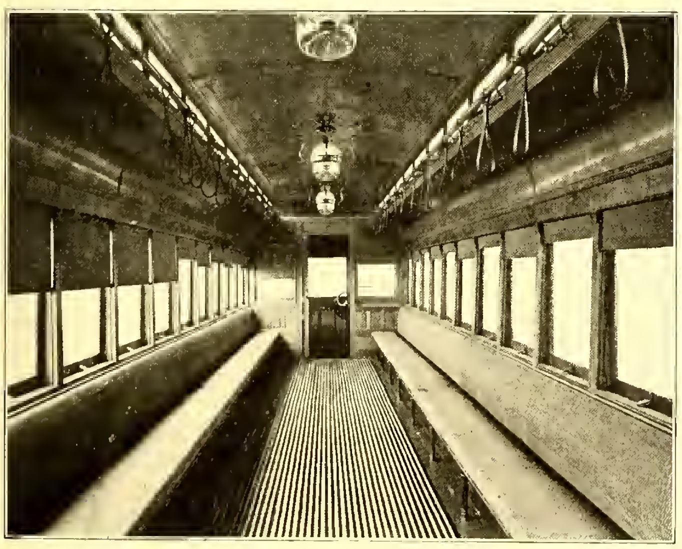
The induction regulators are driven by small series motors of the same general type as the main motors. Both regulators are controlled by the multiple-unit system from a master switch at either end. They may be stopped at any desired point in their travel, and thus the locomotive may be run at any speed with the same facility and economy as a steam locomotive.

Forced ventilation is used with the auto-transformers and induction regulators as well as with the motors, the necessary air being supplied by suitable motor-driven blowers. Motor-driven air compressors are also used.

The locomotive is designed for slow-speed freight service, this type having been chosen because the design of series alternating-current motors for very slow speed service presents many more problems and is much more difficult than the design of equal capacities for the ordinary conditions. This problem having been solved, the production of similar locomotives for passenger service becomes a relatively simple matter. With the motors working at nominal full load output, the locomotive will develop a draw-bar pull of 50,000 lbs. at a speed of approximately 10 m.p.h. On several occasions, however, when hauling the fifty-car train referred to above, steady draw-bar pulls of from 60,000 lbs. to 65,000 lbs. have been recorded on the dynamometer car, and momentary efforts as high as 100,000 lbs. have been obtained, with no sign of slipping of the wheels. With lighter loads the locomotive may be run at higher speeds up to a maximum of about 30 m.p.h.

CAR FOR OPERATION WITH GASOLINE MOTORS

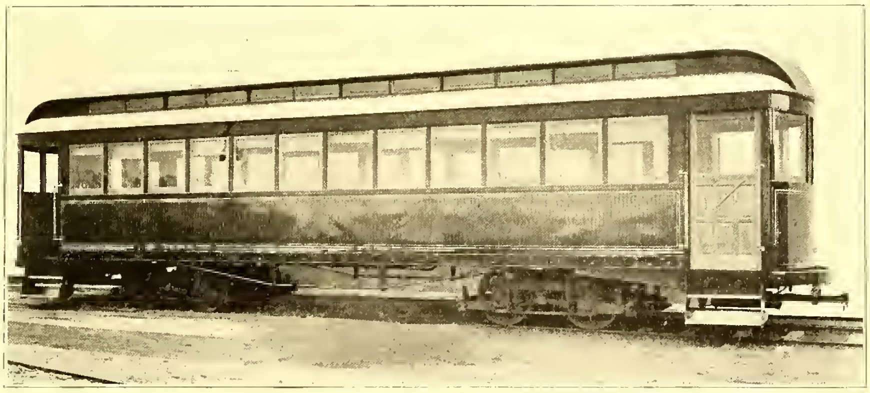
The American Car Company has completed for the Chicago Motor Vehicle Company, Chicago, the interesting type of closed car illustrated. The car is 34 ft. over the end panels and 8 ft. 10 ins. over posts at belt. The seats are longitudinally placed and are upholstered in spring rattan. The windows are



INTERIOR OF GASOLINE CAR FOR THE CHICAGO MOTOR VEHICLE COMPANY

arranged to drop into pockets in the side walls, the openings of which have hinged covers. It is understood that the car is to be used for demonstrating the suitability of the Chicago Motor Vehicle Company's gasoline motor for city and interurban service. The illustration shows the car before it was equipped with motors, but it may be stated that the entire motor equipment will be carried under the car body, and therefore will not change the appearance of the interior.

The inside finish is of ash, with three-ply birch ceilings tinted green and decorated in gold. Brill No. 27-E-1½ trucks are used, having a wheel base of 7 ft. 1 in. and 36-in. wheels. Among the specialties included in the equipment are angle-iron bumpers, "Dedenda" gongs and sand boxes of Brill manufacture. The length over the crown pieces is 43 ft. 5 ins., and from the panel over the crown piece, 4 ft. 8½ ins. The width



CLOSED CAR FOR GASOLINE MOTORS

over the sills is 8 ft. 10 ins. The distance between the centers of the posts is 2 ft. 9 ins. The side sill size is 4¾ ins. x 7¾ ins., and the end sill size, 5 ins. x 7 ins. The sill plates are ⅝ in. x 8 ins. The corner posts are 3¾ ins. thick, and the side posts, 2¾ ins. The height of the steps is 14 ins., and of the risers, 12 ins.

INSULATING VARNISHES AS HEAT CONDUCTORS AND RADIATORS

At the suggestion and under the direction of John C. Dolph, of the Standard Varnish Works, New York, the Electrical Testing Laboratories of that city recently carried out a number of experiments on high-tension, alternating-current coils (for stationary work), varnished with different kinds of insulating compounds, to find out how such varnishes could be made better heat conductors or radiators without sacrificing their insulating qualities. The results of these tests showed that the specially treated compounds prepared by Mr. Dolph were far better heat dissipators than the ordinary insulating varnishes, and also proved the great superiority of treated coils over an untreated coil. During these trials it was found that one of the oleo-resinous base varnishes employed, although usually a poor heat radiator on account of the nature of its surface, had given off more heat than any of the others tested except those specially treated for heat conduction and radiation. Since the insulating qualities of this oleo-resinous varnish are very good, it occurred to Mr. Dolph that varnishes with this base could be improved in the desired direction.

Electrical means were then adopted to find the relative combined heat conducting and radiating qualities of different oleo-resinous and hydro-carbon base varnishes. Eleven spools were used, each about 6 ins. long and 3 ins. in diameter, and wound with No. 18 double cotton-covered wire, eighteen layers, with 108 turns to the layer, making a total of 1944 turns. Thermometric coils were wound in these spools, the outside of No. 38 silk-covered wire with two turns per space, making a total of 214 turns, the middle thermometric coil of No. 40 silk-covered wire with two turns per space, making 214 turns, and an inner thermometric coil of No. 40 silk-covered wire with three turns per space, or a total of 321 turns. These coils were wound on a split form to enable their being handled without the addition of insulation other than that provided by the covering of the wire and the varnish used on the coil. The spools were numbered from 1 to 10, inclusive, and were treated as follows:

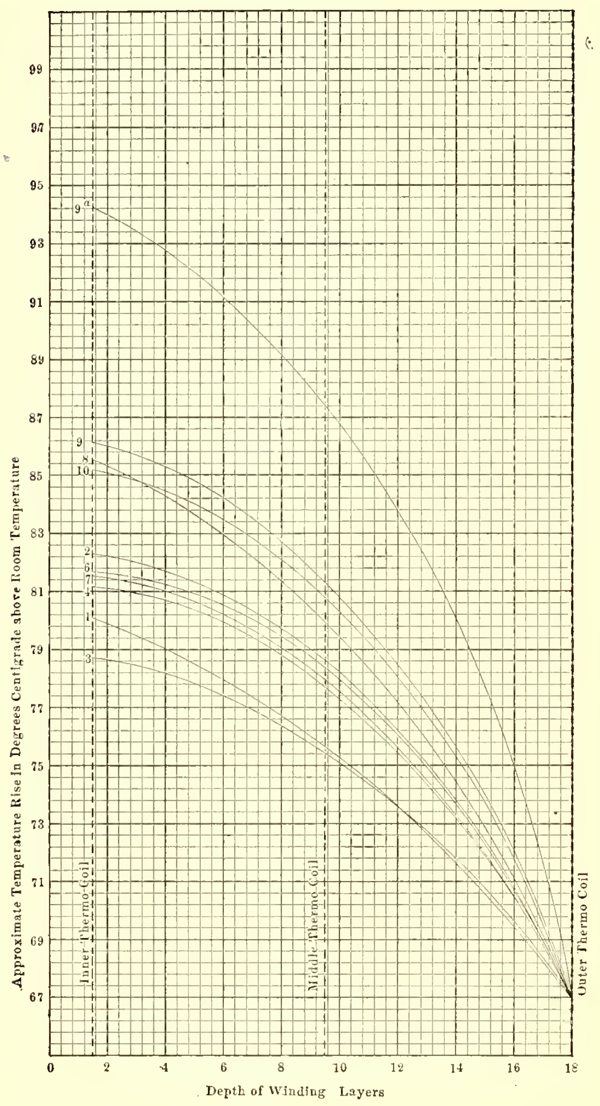
No. 1 Spool.—Clear, quick baking, dipping varnish of oil and gum base variety.

No. 2 Spool.—Clear, baking, dipping varnish of an oil and gum base variety.

No. 3 Spool.—Heat radiating varnish, brown, dipping, baking, of a combined oleo-resinous variety, specially treated for heat radiation and conduction.

No. 4 Spool.—Black, dipping varnish of an oil and hydro-carbon base variety.

No. 5 Spool.—Black, solid compound of bituminous variety,



TEMPERATURE RISE DURING TEST NO. 2

liquefied under heat and used only in connection with vacuum impregnation apparatus.

No. 6 Spool—Black, brushing varnish of a combined oil and hydro-carbon base, treated for heat radiation and conduction.

No. 7 Spool.—Clear, baking, dipping varnish of an oleo-resinous variety.

No. 8 Spool.—Black, air drying and baking, dipping varnish of one of the hydro-carbon group.

No. 9 Spool.—Black, air drying and baking, dipping varnish of a second of the hydro-carbon group.

No. 9a Spool.—Untreated coil of No. 18 double cotton-covered copper wire, wound up dry.

No. 10 Spool.—Gray, brushing, baking varnish of an oleo-resinous variety, treated for heat radiation and conduction.

The varnishes on coils Nos. 1, 2, 3, 4 and 6 were made by the Standard Varnish Works, the remaining compounds being ordinary insulating varnishes of other manufacture. Two methods were used: the first involved the heating of the spools by passing a constant current through them and getting the temperature at the inner, middle and outer surfaces by means of the fine wire thermometric coils, whereby the greatest extreme in temperature would indicate the poorest heat dissipator; the second required the heating of the coils in the same manner and measuring the average rise in temperature by the increase in resistance.

In the first series of tests made, the current used was not sufficient to cause a temperature rise in the spools above 60 degs. C.; in the last series the temperatures obtained were above those usually reached in commercial service. The accompanying table is a summary of the four tests, and the curves show the temperature rise throughout nine of the treated coils and the comparative rise in the untreated coil, No. 9a. Of course, the results obtained are due to the combined heat radiating and conducting qualities of the compounds tested:

SUMMARY OF TESTS NOS. 1, 2, 3 AND 4

Spool No.	Test No. 1		Test No. 2		Test No. 3		Test No. 4	
	Ratio	Relative Order	Ratio	Relative Order	Ratio	Relative Order	Ratio	Relative Order
1	.494	2	.466	2	.484	2	.465	8
2	.532	5	.545	6	.651	7	.643	6
3	.437	1	.419	1	.479	1	.456	1
4	.510	3	.506	3	.530	3	.522	3
6	.513	4	.527	5	.530	4	.530	4
7	.590	6	.520	4	.568	5	.538	5
8	.661	9	.581	7	.670	8	.663	7
9	.654	8	.685	9	.688	9	.759	9
9a	1.000	10	1.000	10	1.000	10	1.000	10
10	.603	7	.653	8	.643	6	.739	8

So far as treating coils used for railway motors are concerned, Mr. Dolph believes that the main consideration in that case is to prepare the coils so as to make them absolutely moisture-proof. This can only be accomplished by the vacuum impregnating method, which involves exhausting the coils of all air and moisture and then impregnating them with a filling compound at great pressure.

THE NEW HAVEN ELECTRIFICATION

Various rumors have been current in regard to the type of electric locomotives to be used by the New York, New Haven & Hartford Railroad Company in the electrification of the western terminal of that line. The decision to adopt electricity, passed by the board of directors, was published in the last issue of this paper. It is now understood that direct-current motors will be used, and that the locomotives will be largely similar to, although not so large as, those of the New York Central Railroad. Specifications for them are now being prepared by W. S. Murray, electrical engineer of the company.

The trolley car is to come to the rescue of the bathers at Atlantic City, N. J. By that is meant that it is to assist them before and after their plunge—before by conveying them to the sea and after by conveying them home. A company about to open a new line to the sea says it will have two cars especially equipped for the use of those who prefer to arrange their "sea" toilet at home, and that these cars will be operated throughout the city at regular intervals for the accommodation of the bathers.

The full bench of the Supreme Court has decided that the Boston Elevated Railway Company is not liable to passengers for personal injuries due to stepping into the space between trains and station platforms, and that it is not "actionable negligence" of the company's servants to make alighting passengers "step lively," or to take measures to prevent crowding in passing out at the side doors.

LEGAL DEPARTMENT*

FALSE IMPRISONMENT—MEASURE OF DAMAGE

There is an elementary distinction in criminal law which it is well for street railway authorities to keep in mind in directing their employees how to deal with disorderly or obnoxious passengers. Criminal offenses are divided into felonies, or major crimes, and misdemeanors, or minor crimes. As to felonies, both peace officers and ordinary citizens have certain powers to arrest without a warrant which it is not necessary now to consider. With regard to misdemeanors, an officer has the right to arrest without a warrant only if the misdemeanor be committed in his presence and the arrest be made immediately. The vast majority of criminal offenses with which the employees of street car companies have to deal are misdemeanors. A passenger is drunk or disorderly, or, although sober, is noisy or quarrelsome, or he refuses to pay his fare and the attempt to expel him from the car leads to a breach of the peace, etc., etc. The quite common procedure is for the conductor to call a policeman as soon as he can find one and cause the arrest of the offender. If it be a case of drunkenness, or other continuing disorderly conduct, the person will be guilty as a misdemeanant in the officer's presence, so that the latter has a right to make the arrest on his own responsibility. Very frequently, however, the arrest is made for an alleged misdemeanor already committed, upon the mere statement by the conductor as to what has occurred. In such a case the arrest is illegal and the railroad company is liable in damages for its instrumentality, through the acts of its agent, in procuring a false imprisonment. The practical suggestion is to discourage the practice of having persons arrested unless their condition or acts are such that the peace officer, when summoned, can act on his own initiative because the misdemeanor is committed in his presence. Where an offense committed outside of the officer's presence is sufficiently serious, the arrest of the offender may subsequently be properly procured upon the warrant of a magistrate.

When a person who has been arrested sues for false imprisonment, he usually denies in whole or in part the conductor's charges of improper conduct, and the result of the case turns largely on what the jury determines upon conflicting testimony —the usual bias against corporations to be reckoned with. The illegal arrest itself affords the technical right to sue, and the law is not at all settled upon the important question as to the measure of damage. Some courts hold that the responsibility of the complainant ends with the arrest itself, and that no damages subsequently suffered are chargeable to its procurer. Other courts take the position that the liability of the instigator of the arrest runs down to the time of the arraignment of the prisoner before a magistrate, and draw the line at that point. Still other courts are of opinion that the procurer of the arrest is liable for the whole train of causation started by him, so that he may be held responsible in damages, even for illegal and oppressive acts committed by the magistrate in disposing of the case when it comes before him. Still another group of cases has made liability for what takes place after the arraignment depend upon whether the procurer is guilty of undue or malicious urgency, instead of submitting the matter as colorlessly as possible to the magistrate. This latter test is a very difficult one to administer in practice. If a person cause an arrest it is incumbent on him by his testimony in some measure to justify it, and the decision whether he exercised fair impartiality in discharging a public duty, or went further and acted upon personal resentment or maliciously, would call for the nicest discrimination. There is considerable to be said in favor of the theory limiting the complainant's liability to damages that have accrued prior to the arraignment before the magistrate, and presuming that from that point on, it is the act of a public officer and not of a private individual that causes such further indignity as may be suffered. Nevertheless, it is also argued, with very great force, that if the whole proceeding be wrongful, the fact that the magistrate held the prisoner and assumed to punish him when a discharge should have been granted is legitimately to be taken into consideration in determining the amount of damage in which the original wrongdoer should be mulcted. Conceding that the sole responsibility rests on a magistrate for acts done in pursuance of lawful process, or lawful arrest, the situation is different where the proceeding at its inception and throughout its whole course is illegal.

Without attempting here to express a decided opinion as to which theory of the limit of damages is the proper one, enough has probably been said to emphasize the necessity of caution in procuring arrests without warrants.

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CHARTERS, ORDINANCES, FRANCHISES.

CALIFORNIA.—Taxation—Street Railways—Railroads—Constitution—Construction.

Const. art. 13, Section 10, provides that the franchise, roadway, roadbed, rails, and rolling stock of all railroads operated in more than one county in this state shall be assessed by the state board of equalization at their actual value, and the same shall be apportioned to the counties, cities and counties, cities, towns, townships, and districts in which said railroads are located, in proportion to the number of miles of railway laid in such counties, cities and counties, cities, towns, townships, and districts. Held, that in view of the differences in the nature of franchises of railroads and of street railways, and of the fact that the value of the different portions of a street railway line varied according to the density of the population of the localities traversed, "street railways" were not included within the term "railroads" in said section, as being of the class of subjects intended to be dealt with by its provisions. —(San Francisco & S. M. Electric Ry. Co. vs. Scott, Tax Collector, S. F. 2285, 75 Pacific Rep., 575.)

GEORGIA.—Municipal Corporations—Powers of Council—Granting of Street Franchise by Resolution—Constitutional Law—Taking Property without Compensation—Equity Jurisdiction—Preventing Multiplicity of Suits—Adequate Remedy at Law—Injunction—Use of Street—Street Railway.

The mayor and council of the city of Savannah, Ga., are authorized by the city's charter (MacDonell's Code, p. 12, Section 32) to make, ordain, and establish "by-laws, ordinances, rules and regulations," but nowhere, in terms, to legislate by resolution; and in view of cognate provisions requiring the improvement of streets, regulating the speed of street cars, etc., to be by ordinance, and of section 44, which provides that the city may either build street railways, "or let or farm the privilege to individuals or companies under the conditions and at such rates of fare and other charges as the city council of said city may by ordinance determine," the mayor and council have no power to grant a franchise to a street railroad company to occupy a street with its tracks by a resolution, and such a resolution passed without notice to owners of property on the street affected, and without prior publication as required by the charter in case of ordinances, is void and confers on the company no right or authority.

2. The owners of property fronting on a street may maintain a suit in equity in a federal court against the city and a street railroad company, both of which are corporations of the State, to enjoin the laying of tracks in the street under a void enactment by the city council purporting to authorize such act, where irreparable injury will result to their property, as a taking of property under color of authority from the state without due process of law.

3. Such suit is within the jurisdiction of equity, where the complainants are numerous, on the ground that it will prevent a multiplicity of actions, and for the further reason that there is no adequate remedy at law.

4. For a municipal corporation, over the protest of every abutting lot owner on a residence street, to refuse them a hearing, and grant in secret caucus to a street railway the right to appropriate said street for its track, to be used to shunt all the empty cars in use in the city into the car houses at midnight, and to distribute them at dawn, thus destroying the quiet, repose, and comfort of many homes, when the railway has a parallel track one block away, long used, and ample for such purpose, is unnecessary, unreasonable, and oppressive municipal action, and should be enjoined by a court of equity having jurisdiction.—(Holst et al. vs. Savannah Electric Co., et al., 131 Feb. Reb., 931.)

KENTUCKY.—Trunk Railroad—Meaning of Term—Municipal Corporations—Franchises.

1. An electric railroad company authorized to perform the duties of a carrier of freight and passengers between two cities in different States and all intermediate points is a trunk railway within the Con-

stitution, Section 164, declaring that no city shall grant any franchise to street railways, gas, water, or certain other corporations, except to the highest and best bidder therefor, but that the section shall not apply to a trunk railway.—(Diebold vs. Kentucky Traction Co., 77, S. W. Rep., 674.)

MICHIGAN. — Street Railways — Municipal Regulations — Air Brakes—Ordinance—Validity—Presumptions.

1. Under Comp. Laws, Sections 6425, 6447, providing that no street railway company shall be authorized to construct its railway in streets of a town or city without its consent and under such regulations as the authorities may prescribe, provided that after such consent is given the authorities shall make no regulations destroying the franchises so granted, and under the power reserved in an ordinance granting a franchise to a street railway company to make such further regulations as might be deemed necessary to protect the public, the authorities had power to pass an ordinance requiring the street railway company to equip its cars with air or electric brakes.

2. An ordinance showing on its face that it contemplates providing a safeguard against danger to the public will be presumed to be valid, and the burden of proof will be on one who attacks its validity.

3. The discretion of a city council in enacting an ordinance requiring street railway companies to equip their cars with certain brakes for the greater safety of the public will not be interfered with if the regulation can fairly be said to tend toward a better and safer condition.

4. Before an ordinance requiring street railway companies to equip its cars with air or electric brakes can be declared invalid, it should clearly appear either that a more efficient brake than a hand brake was unnecessary, or that neither an air nor an electric brake would be such; and, if the newly required brake is to be used in addition to the hand brake, it should be shown that a car equipped with both would not be safer than with the hand brake alone.

5. Though a preponderance of oral testimony supports the view that an ordinance requiring air or electric brakes on street railway cars is unreasonable, it would be insufficient to nullify the ordinance, as the court may take judicial notice that air brakes are extensively used, and are rarely ineffective.

6. An ordinance requiring a street railway company to equip its cars with air or electric brakes is not invalid because requiring a large outlay of money on the part of the company.

7. The ordinance is not invalid because electric brakes are shown to be ineffective and the ordinance does not designate between air and electric brakes.—(People vs. Detroit United Ry., 97, N. W. Rep., 36.)

NEW YORK.—Appeal—Review—Errors of Law—Street Railroads —Extensions—Procedure.

1. When the findings of the trial court are supported by the evidence, and sustain a judgment rendered thereon which has been affirmed by the Appellate Division, failure to find other facts claimed to have been established by the evidence is not error of law reviewable in the Court of Appeals.

2. Railroad Law, Section 90 (Laws 1895, p. 791, c. 933), prior to the enactment of Laws 1902, p. 610, c. 226 in relation to the extension of street-surface railroads, provided that any such road extending its roads or constructing branches thereof might file in the office in which its certificate of incorporation was filed a description of the roads and property upon which it was proposed to construct the extension, and on filing such statement and obtaining the consent of adjoining property owners might have the right to operate and maintain such extensions. Held, that a street-surface railroad corporation incorporated in 1895, which filed in 1901 a statement in conformity with Sections 90 (Laws 1895, p. 791, c. 933) and 91 (Laws 1901, p. 1529, c. 638), has the right to construct an extension without the certificate of the Board of Railroad Commissioners as to public convenience and necessity thereof, as required by Laws 1902, p. 610, c. 266, which, added to Section 59a a provision for such certificate, so that an action brought by a steam railroad company to restrain a street railroad company from constructing an extension, cannot be maintained, on the ground that the certificate required has not been obtained.—(New York Cent. & H. R. R. Co. vs. Auburn Interurban Electric Ry. Co., 70, N. E. Rep., 118.)

NEW YORK.—Injunction—Street Railways—Use of Track.

A surface railway company operating in A. and a similar railway company operating between S. and A. entered into an agreement giving the latter road the right to run its cars over the tracks of the former in A., the cars not to be of such excessive size or run at such excessive speed as to endanger the property of the former company. It was further agreed that, until another type of cars was agreed upon, cars 48 ft. over all, and not exceeding 25 tons when loaded, could be used. The A. Railway Company objected to certain cars which had been run for some time without accident or injury, and used physical force to prevent the S. Railway Company from running the cars over the A. tracks. Held that in view of the rights of the public to travel over the S. Railway and over the tracks of the A. Railway Company, and of the insignificance of the matters in dispute, the A. Company would be restrained from further interference, and must seek any relief desired in the courts.—(Schenectady Ry. Co. vs. United Traction Co., 89 New York Supp., 931.)

NEW YORK.—Taxation—Assessment of Special Franchises—Certiorari—Intervention by City—Same—Res Adjudicata.

1. Certain corporations, by certiorari against the State Board of Tax Commissioners, procured the reduction of the assessments on their special franchises on proof that they had been assessed at their full value, whereas the real estate of the city was assessed at only 80 per cent. of its value. The mayor of the city filed an affidavit, on information and belief, that the city real estate was assessed at its full value, and that the special franchises had not been so assessed, and that the city had not appeared at the proceedings reducing the assessments of such corporations. Held that the orders reducing the same will be set aside, and the city permitted to intervene and contest the alleged inequality.

2. Under Laws 1900, p. 512, c. 254, Section, 2, in proceedings by a corporation to procure before the State Board of Tax Commissioners a reduction of assessments on their special franchises, the city was entitled to be made a party; the section providing that no certiorari to review an assessment of a special franchise should run to any other board or officer than the State Board of Tax Commissioners, unless otherwise directed by the court or judge granting the writ.

3. Orders of the State Board of Tax Commissioners reducing valuations of special franchises in a city by proceedings in which the city was not a party are not res adjudicata as to the city.—(People ex rel. Rochester R. Co. vs. Priest et al., Tax Commissioners. People ex rel. Rochester Gas & Electric Co. vs. Same, 85 New York Sup., 235.)

TENNESSEE.—Privilege Tax—Due Process.

1. The provision of Acts 1903, p. 599, c. 257, imposing a privilege tax on the business of advertising in cars, that the street car or railroad company leasing or selling the advertising privileges shall be liable for the payment of the tax, is a deprivation of property without a hearing or due process of law, in contravention of Const., Art. 1, Section 8, and Const. U. S. Amend. 14.—(Knoxville Traction Co. vs. McMillan, 77 S. W. Rep., 665.)

TEXAS.—Street Railroads—Equipment of Cars—Ordinance—Construction—Actions—Evidence—Instructions.

1. Statutes and ordinances must be reasonably construed, and in a manner not repugnant to common sense.

2. An ordinance making it unlawful to operate a street car unprovided with a fender of the most improved design and construction, and providing that every electric street car shall have a conductor and motorman, requires a fender and motorman only on motor cars, and not on trailers.

3. In an action against a street railroad for injuries to one attempting to board the car, a question as to whether the conductor could have stopped the car, and prevented injury, had he been on the rear platform of the motor car, or front platform of the trailer, called for an opinion, and was properly excluded.

4. In an action against a street railroad for injuries to one attempting to board a car, the court properly refused to present a case to the jury not made by the pleadings or evidence.—(Von Diest vs. San Antonio Traction Co., 77 S. W. Rep., 132.)

VERMONT.—Eminent Domain—Taking of Land Without Payment—Acquiescence of Owner—Same.

1. Where a landowner expressly consents or clearly acquiesces in the taking of right of way over his land for a railroad without payment, his right to hold the land is gone, and he has only a personal claim against the company for the debt.

2. The absence of any agreement between a landowner and a railroad company as to the price to be paid for right of way, or the manner of determining the same, negatives a claim that the company was to be given credit, and the owner's right to the land can only be extinguished by appraisal and payment.—(Bibber-White Co. vs. White River Valley Electric R. Co., 131 Fed. Rep., 995.)

LIABILITY FOR NEGLIGENCE.

ALABAMA.—Street Railroads—Collisions—Injury to Horse and Buggy — Evidence — Instructions — Contributory Negligence—Pleadings—Allegations—Matters Provable Under General Issue.

1. An assignment of error based on the overruling of a demurrer to the complaint, not supported by argument or citation of authorities, and the complaint stating a cause of action, will not be reviewed on appeal.

2. A driver who stops his vehicle in a street, with one of the rear wheels within a few feet of a street car track, is not guilty of contributory negligence as a matter of law, precluding a recovery for the injuries sustained in a collision with a street car.

3. To drive a horse, which is afraid of a street car, on a narrow street in which there is a car track, does not as a matter of law constitute negligence contributing to an injury sustained in a collision with a street car.

4. The allegation, in a special plea in an action against a street railway company for injuries sustained in a collision with a street car, that the motorman in charge of the car used all appliances at hand to stop the car, but was unable to do so, alleges matter provable under the general issue.

5. A special plea, in an action against a street railway company for injuries sustained in a collision with a street car, which alleged that plaintiff's horse and buggy were standing across a street, with the rear wheel of the buggy within a few feet of the street car track; that when an approaching car got within 20 ft. of the horse, the horse became frightened and began to back the buggy onto the track; that the motorman, on discovering the peril, applied the brakes, and used all appliances at hand to stop the car, and did everything in his power to stop it, but was unable to do so before the collision—alleged matter within the general issue.

6. Where, in an action for injuries to a horse, sustained in a collision with a street car, there was evidence tending to show that before, and up to the time of the collision the horse was docile, not afraid of cars, but that after the collision it was of an ill-disposition, afraid of cars, difficult to drive near cars, etc., and there was nothing to suggest a cause for the change other than the collision, the jury were warranted in finding that the change was due to the collision.

7. Where, in an action for injuries to a horse, sustained in a collision with a street car, the jury were warranted in finding that the collision caused a change in the disposition of the horse, it was competent to show the value of the horse before and soon after the collision, based on a change of disposition.

8. In an action for injuries to a horse, sustained in a collision with a street car, evidence of the condition of the horse as to gentleness a month or two before the collision, and the value of the horse at that time, was competent, especially in connection with evidence that such condition continued up to the time of the collision.

9. In an action for injuries to a horse, sustained in a collision with a street car, evidence of the condition of the horse as to its wildness two or three months after the collision, and of the depreciation of its value at that time in consequence thereof, was admissible, especially in connection with other evidence that this condition had existed since the collision.

10. In an action against a street railway company for injuries to a horse, sustained in a collision with a street car, the testimony of a witness as to the decrease of the market value of the horse, due to a cut received in its side, was not objectionable, on the ground that he was not an expert.

11. In an action for injuries to a horse, sustained in a collision with a street car, the question asked plaintiff, "What was the horse worth before the injury," was not objectionable as not being a proper test of the value of the horse.

12. The error, if any, in excluding evidence subsequently admitted, is not prejudicial.

13. Where, in an action for injuries sustained in a collision with a street car, the motorman testified that he had exercised every possible care to avoid the collision, it was competent, for the purpose of laying a predicate for his impeachment, to ask him if he had stated to a person named, immediately after the collision, that it would not have happened if he had been more careful.

14. Where, in an action against a street railway company for injury to a buggy by reason of a collision with a street car, it was shown that plaintiff had owned and used it for several months, and that it had been used for several months before he bought it, it was prejudicial error to permit a witness to answer the question if it was not true that when an article became "second-handed" it lost much.—(Montgomery St. Ry. vs. Hastings, 35 S. Rep., 412.)

ALABAMA.—Street Railroads—Personal Injury—Collision—Contributory Negligence—Negligence—Proximate Cause—Instruction—Appeal.

1. The failure to insist on assignments of error is a waiver thereof.

2. Where the servants of a street railroad might have avoided a collision with a wagon, but for their negligent failure to keep a lookout, any negligence on the part of a person in the wagon in causing it to be in the way of the car was not the proximate cause of an injury to the occupant of the wagon resulting from the collision.

3. In an action against a street railroad for injuries in a collision with plaintiff's wagon, where there was evidence which would have authorized the jury to find that plaintiff's injuries were directly attributable to the subsequent negligence of the defendant's servants in charge of the car in failing to keep a lookout, and that but for such negligence the injuries would not have been inflicted, a charge of contributory negligence was properly refused, as calculated to mislead the jury.—(Birmingham Ry. Light & Power Co. vs. Brantley, 37 S. Rep. 698.)

ALABAMA.—Street Railways Killing Cattle—Duty of Motorman—Negligence—Evidence.

1. A motorman of a street car is bound to keep a lookout for live stock, and not to run his car at such a rate of speed that he cannot stop it within the distance he can see such animal on the track.

2. In an action against a street railroad company for killing plaintiff's cow, evidence held to support a finding that the motorman was guilty of negligence entitling plaintiff to recover.—(Anniston Electric & Gas Co. vs. Hewitt, 36 S. W. Rep. 40.)

CALIFORNIA.—Street Railroads—Injuries—Bicycle Riders—Racing—Speed—Violation of Ordinance—Contributory Negligence—Proximate Cause—Last Clear Chance—Wanton Injury—Evidence—Instructions—Modification — Appeal — Harmless Error.

1. Where deceased was killed in a collision with a street car while he was riding in a bicycle race as a part of a Fourth of July celebration, and at the time of his injury he was violating a city ordinance limiting the rate of speed of bicycles in the city, he was guilty of contributory negligence as a matter of law.

2. Evidence in an action for death of a bicycle rider by collision with street car considered, and held that the negligence of the motorman in failing to exercise reasonable care to avoid the collision after discovering decedent's peril, and not decedent's contributory negligence, was the proximate cause of the injury.

3. Where the motorman had the last clear chance of avoiding the accident by the exercise of ordinary care, the street car company was liable for his failure to do so.

4. The reasonableness of the rider's efforts to escape the injury after discovering the danger was a question for the jury.

5. Where a street railway motorman, with knowledge of the danger of injury to bicycle riders racing along a public street, willfully started to run his car across the street, and by the exercise of ordinary care, after discovering deceased's peril, could have stopped and prevented the accident, and it appeared that deceased on discovering the car attempted to avoid it, decedent's negligence did not continue to the moment of the accident, so as to sustain a conclusion that both parties were contemporaneously and actively at fault at the time thereof.

6. Where, in an action for death of a bicycle rider caused by a collision with a street car, the motorman testified that he moved his car, because he thought he had plenty of time, and that it was dangerous for him to stop the car at that time, the sustaining of an objection to a question as to whether the motorman would have moved the car at the time if he had supposed that he was thereby endangering the lives of deceased and other bicycle riders on the street was harmless.

7. Where decedent's death was alleged to have been caused by the wanton negligence of a street railway motorman, an instruction that, though one might not have the actual intent to injure, still, if there is a reckless indifference or disregard of the probable consequences of doing or omiting to do an act, conscious from his knowledge of existing circumstances that his conduct will likely or probably result in injury, he is guilty of wanton negligence, was proper.

8. In an action for death of a bicycle rider in collision with a street car, an instruction that where an injured party's negligence brings him into danger, and defendant discovers the danger in time to avoid the injury by the exercise of ordinary care, and fails to do so, the defendant is liable if the injured party, after discovering his danger, exercises ordinary care to escape, was not objectionable, as relieving the injured person from the consequences of his failure to discover his own danger resulting from his own negligence.

9. Where defendant was not entitled to have an instruction given as requested, a modification thereof which, though it took away the whole effect of the requested instruction, did not add anything prejudicial to defendant's case, was not error.

10. Where it was alleged that deceased came to his death through the wanton negligence of defendant's motorman, instructions using the word "reckless" as the equivalent of "wanton" were not objectionable, on the ground that such terms were not synonymous.

11. Where a requested instruction was erroneous in withdrawing from the jury a material issue, a modification thereof, by omitting the direction that the verdict should be for defendant in case they found in conformity with the instruction, was not error.

12. It is not error to refuse portions of requested instructions covered by the charge given.

13. Where deceased was killed in a collision with a street car alleged to have resulted from the willful negligence of the motorman after discovering decedent's peril, the modification of a requested instruction that if deceased, by ordinary care, might have discovered the approaching car, and he did not exercise such care, he was guilty of such negligence as would prevent a recovery by adding the words, as against any "ordinary negligence" of the defendant, was not erroneous, as injecting the doctrine of comparative negligence into the case, the words "ordinary negligence" being used to mean such negligence as might have existed in the absence of actual knowledge of the motorman of decedent's perilous position and a clear opportunity to avoid injuring him.—(Harrington et al. vs. Los Angeles Ry. Co. [L. A. 1128], 74 Pac. Ry., 16.)

CONNECTICUT.—Street Railway—Collision with Vehicle—Leaving Horse Unhitched—Violation of City Ordinance—Instruction—Proximate Cause—Prejudicial Error—Negligence—Irrelevant Evidence.

1. A city ordinance declared "leaving any horse unhitched" within a street a nuisance and punishable by fine. In an action against a street car company for an injury to plaintiff's milk wagon, the evidence showed that the driver had left the wagon standing across the car track while he went to deliver milk, and that he was absent in the kitchen of a neighboring house, the collision occurring as he emerged therefrom. The court instructed that under the ordinance a horse must not be allowed to remain unhitched without being in the effective control of some person; that what is effective control will largely depend on the facts of the particular case; that a timid and inexperienced horse would require a different kind of control from one shown to be reliable, and that it was for the jury to determine whether the horses as left by the driver were beyond his control. Held, erroneous, as practically instructing that the ordinance only prohibited negligently leaving a horse unhitched in a street.

2. Doing an act forbidden by statute will not bar a recovery for injuries sustained by the law-breaker, unless the illegal act was a proximate cause contributing to the injury.

3. Leaving horses attached to a milk wagon standing in the street unhitched and unattended, in violation of a city ordinance, the wagon being across a car track, while the driver delivers milk, may be a proximate cause of an injury to the wagon from a collision with a street car, and therefore an instruction erroneously construing the ordinance is error of a prejudicial character.

4. In an action against a street car company for an injury to a milk wagon from a collision with a car, cross-examination eliciting from the motorman the admission that on another line he had some trouble in managing his car is error.—(Munroe vs. Hartford St. Ry. Co., 56 Atl. Rep., 498.)

ILLINOIS.—Servant's Injuries—Fellow Servants—Department Rule—Direct Co-operation—Business in Hand—Personal Acquaintance—Necessity—Street Railroad Employees—Questions of Law—Questions of Fact—Burden of Proof.

1. In an action for a servant's injuries, the plaintiff has the burden of proving the non-existence of the relation of fellow servants.

2. A refusal to charge that the burden was on plaintiff to prove that he and the servant by whose negligence he was injured were not fellow servants was not error, where the question was covered by another instruction, stating that the burden of proof was upon plaintiff on several different propositions, and that he could not recover unless the fact that he and the other servant were not fellow servants was established by the preponderance of the evidence.

3. What facts will create the relation of fellow servants is a question of law, but whether such facts exist is a question of fact, unless there is no evidence fairly tending to prove that they are not fellow servants, and the undisputed facts showed that the relation existed, in which case the question again becomes one of law.

4. The relationship of fellow servants depends on the existence between servants of an association which enables them, better than the employer, to guard against risk or accident resulting from the negligence of each other. It does not rest in any decree upon personal acquaintance or actual previous association between the servants, but upon the relation of their duties to each other, and the respective positions they hold.

5. The conductor on one car of a cable company is not engaged in the "particular business" in which the gripman on a following car is engaged, so as to make the two fellow servants.

6. Where there is a direct co-operation between servants of a common master, there is nothing further necessary to make them fellow servants; but, where they are not directly co-operating in some particular work, their usual duties must require co-operation or actual association, to bring them within that relation.

7. The conductors and gripmen on the different cars of a street railway, who were in duty bound to run their cars in such a manner as not to injure the employees on other cars, and who had the same headquarters, were under the same superintendent, and governed by the same rules, were engaged in the same character of service, and were brought into such relation with each other as to depend on each other for their safety, with power to observe the manner in which each discharged his duties, and to influence each other by caution and example, and were thus, as a matter of law, fellow servants.—(Chicago City Ry. Co. vs. Leach, 70 N. E. Rep., 222.)

ILLINOIS.—Personal Injuries—Measure of Damages—Instructions—Harmless Error—Sufficiency of Evidence—Judgment of Appellate Court—Conclusiveness.

1. In an action for personal injuries, an instruction that in estimating plaintiff's damages it was proper to consider the effect of the injury upon the plaintiff, and also the bodily pain and suffering which she sustained, and all damages charged in the declaration, and which, from the evidence, were shown to be the necessary and direct result of the injury, was, in view of evidence that plaintiff had sold out her business after the accident, erroneous, because allowing the jury to consider bodily pain and suffering, and the effect of the injury on plaintiff, in addition to damages charged in the declaration and shown by the evidence.

2. In view, however, of a number of other instructions stating that it was the duty of the jury to decide the case solely from the evidence under the instructions, the error was harmless.

3. On appeal from a judgment of the Appellate Court affirming a judgment on a verdict, it must be presumed that that court found the judgment not to be against the weight of the evidence, though in the opinion it stated that the weight of the evidence seemed to be with the defeated party.—(Chicago City Ry. Co. vs. Mead, 69 N. E. Rep., 19.)

ILLINOIS.—Street Railways—Negligence—Personal Injuries—Res Ipsa Loquitur—Runaway Car—Pleading.

1. Failure of a person about to cross a railroad track to stop and look is not negligence per se.

2. Where plaintiff in an action against a street railway company for personal injuries testified that he looked for an approaching car before going on the track, the alleged fact that, if plaintiff had looked, he must have seen the car which injured him, does not justify the Supreme Court, on appeal, in saying that there was no evidence that plaintiff was in the exercise of ordinary care; the credibility of plaintiff's testimony being a question of fact.

3. While plaintiff was driving along defendant railway company's track, his vehicle was struck from the rear by a sprinkling car having no one in charge of it, and plaintiff was injured. The motorman who had been in charge of the car had fallen off some distance from the point of collision, from the effects, as he testified, of an electric shock. Held, to raise a presumption of negligence on the part of defendant.

4. In an action for personal injuries from negligence, in which the occurrence of the accident raises a presumption of negligence, the question whether defendant's explanatory evidence sufficiently rebuts the presumption is one of fact for the jury.

5. Where the declaration in an action against a street railway company for personal injuries alleged that defendant carelessly, negligently, and wrongfully ran and managed its car, there was no charge of specific acts of negligence, precluding plaintiff from relying on the presumption of negligence arising from the happening of the accident.—(Chicago City Ry. Co. vs. Barker, 70 N. E. Rep., 624.)

ILLINOIS.—Personal Injuries—Extent of Injury—Evidence—Expert Testimony—Earning Capacity—Instructions.

1. In an action for personal injuries, plaintiff on the first trial complained only of an injury to his hip and ankle, but on the second trial offered evidence tending to prove that an oblique inguinal hernia and a detachment of the retina of one eye resulted from the accident, and on a third trial proved that he was still suffering from the hernia, and that the eye had grown so much worse since the second trial that the eyeball had to be removed. There was evidence that before the accident plaintiff was able-bodied and healthly, suffering from none of the ailments complained of, and that shortly after the accident the hernia and injury to the eye became apparent, and continued to grow worse until the last trial. It was also in evidence that the injuries might have been caused by the accident, and were of such a nature as to develop slowly, so that they might not be discovered until after the first trial. Held, that evidence as to these injuries was properly admitted on the third trial.

2. In an action for personal injuries, the opinion of a physician

as to the cause of an injury to plaintiff's eye was competent, though witness had not examined plaintiff until long after the accident.

3. In an action for personal injuries, evidence that for several years plaintiff had worked in a rolling mill, receiving $100 a month, was admissible on the issue of earning capacity, although he had quit his position about two months before the accident, and was at that time working as a laborer, receiving much less.

4. In an action for personal injuries, an instruction that "the court does not intimate to you an opinion as to whether one party was in the exercise of ordinary care, or the other party was guilty of negligence as alleged. These questions are for your determination alone from the evidence in the case," was not erroneous as impressing the jury that they were at liberty to decide regardless of the instructions, where other instructions expressly stated that the instructions must be accepted as the law of the case, that the jury should look to the evidence for the facts and to the instructions for the law, and that the evidence and instructions should alone control the verdict.—(West Chicago St. Ry. Co. vs. Dougherty, 70 N. E. Rep., 586.)

ILLINOIS.—Personal Injury—Future Damages—Instruction—Contributory Negligence—Standard of Care—Appeal for Purposes of Delay.

1. In a personal injury case the evidence showed that plaintiff's left shoulder had been dislocated, the bones of the nose fractured, and a cut made over the right eye, exposing the bone. Evidence for plaintiff disclosed that at the time of the trial—more than a year and a half after the accident—his left arm could not be raised above a horizontal line; that the natural motion was limited, and an attempt to raise it higher caused pain; that the vision of the right eye was diminished one-fourth or one-third, and that the defective eyesight was permanent, and likely to increase. Held, that an instruction permitting a recovery for future pain or suffering, or future inability to labor and transact business, was proper, though there was evidence that at the time of the trial plaintiff was still employed as a teamster, and was earning the same wages as before the accident.

2. In an action for personal injuries it was not error, in instructing on contributory negligence, to define ordinary care as that care and foresight to avoid danger which a person of ordinary prudence, caution, and intelligence would "usually" exercise under the same or similar circumstances.—(Chicago Union Traction Co. vs. Chugren, 70 N. E. Rep., 573.)

INDIANA.—Street Cars—Collision with Team—Negligence—Pleading and Proof—Contributory Negligence—Failure to See Car—Driving on Left-hand Side of Street.

1. A complaint for injury from the negligence of defendant's employees need not in terms aver they were acting in the line of their duty, but it is enough to aver that defendant, by its agents, etc., negligently operated the street car by collision with which plaintiff was injured.

2. Though the complaint allege various acts of negligence, they need not all be proved to make defendant liable.

3. One driving on the left-hand side of the street because the right-hand side was in such condition as to render it impracticable or unsafe to travel thereon does not violate an ordinance requiring drivers "to keep as nearly as practicable to the right of such street."

4. Plaintiff, while driving on a dark, foggy night, with a compainion, like himself, of mature age, and in possession of his faculties, with the wheels on one side of the wagon within the street car tracks, though there was plenty of room outside the tracks, was struck at a point, where there was no obstruction to the view for 500 ft., by a street car lighted by electricity coming from the opposite direction. The car was not seen by them till just before it struck the wagon. Held there was contributory negligence barring recovery.—(Indianapolis St. Ry. Co. vs. Slifer [No. 4877], 72 N. E. Rep., 1055.)

INDIANA.—Street Railways — Collision — Action — Evidence — Declaration of Bystander—Instructions—Care Required in a City.

1. In an action for injuries the action of the court in overruling a motion of defendant for a preemptory charge to find for him on a paragraph of the complaint charging a willful infliction of the injury, if error, was harmless, it appearing from special findings that the general verdict for plaintiff was not based on that paragraph.

2. In an action for injuries to one who was run down by a street car, the testimony of a witness who saw the accident as to remarks made by him to the motorman when he stopped the car were inadmissible.

3. In an action for injuries to one run down by a street car, an instruction that greater care in operating cars is required in populous cities and crowded streets than in sparsely settled districts and streets or highways upon which there are few travelers, was erroneous, as invading the province of the jury.

4. In an action for injuries to one run down by a street car any evidence tending to show that the place where the accident occurred was in a populous city or crowded street was proper to be considered by the jury in the determination of defendant's negligence.—(Indianapolis St. Ry. Co. vs. Taylor [No. 20,395], 72 N. E. Rep., 1045.)

INDIANA.—Wrongful Death—Street Railroads—Persons on Track—Care Required—Negligence—Evidence—Instructions—Harmless Error.

1. In an action for the death of a young child by being run over by a street car, an instruction that in such a case the motorman "must make sure" that the child will be free of the track at the point where it is crossing or approaching the track, before the car reaches him, was objectionable, as requiring too high a degree of care, the railroad company not being an insurer of the child's safety.

2. Where, in an action for the killing of a child in collision with a street car, the uncontradicted evidence clearly established that the verdict was right, and that the merits of the cause had been fairly tried, a judgment on such verdict will not be reversed because of an erroneous instruction, under Burns' Ann. St. 1901, sec. 670, forbidding reversal where it appears to the court that the merits of the cause have been fairly tried and determined in the trial court.

3. Where a child killed in collision with a street car was non sui juris, it was only required to exercise such care as could be reasonably expected of a child of its age and intelligence.

4. In an action against a street railway company for killing a child on the track, evidence held to establish the motorman's negligence in not stopping the car when he first saw the child in the roadway, going toward the track.—(Indianapolis St. Ry. Co. vs. Schomberg [No. 20,510], 72 N. E. Rep., 1041.)

INDIANA.—Street Railroad—Injury—Pleading—Evidence—Instructions.

1. Cause of action is stated by a complaint alleging that a street car company negligently carried on the front of its car a banner for advertising purposes, calculated to frighten horses, and that it caused plaintiff's horse to become frightened and unmanageable, resulting in the injuries complained of.

2. It is sufficient if contributory negligence is proved by a preponderance of the evidence, whether it is given by plaintiff or defendant, or both.

3. A charge that the burden is on defendant to prove contributory negligence is harmless error, where no evidence of contributory negligence was given by plaintiff.

4. A charge that plaintiff's theory is that his injury was caused by his horse being frightened by an unnecessary banner on the front of defendant's car, and he cannot recover unless it is proven both that the horse was frightened from that and no other cause, and that the banner was not necessary, is not erroneous, though incomplete in its statement of plaintiff's theory.

5. A charge in an action for injuries caused by fright of a horse from a banner carried on a street car, that if the company was running its cars in the ordinary way, and the horse became frightened at the running or appearance of the car aside from the banner, the company is not liable, is not objectionable as requiring proof that the car was run in the ordinary way.

6. Where plaintiff had testified that a banner on a street car by which his horse was frightened was an advertisement of a carnival, and it appeared that all the carnival banners were alike, testimony of other witnesses as to the size of these banners was properly admitted.

7. Where testimony of plaintiff's witnesses concerning banners other and different from the one which frightened his horse was brought out only on cross-examination, it was not reversible error to exclude defendant's evidence contradicting this testimony.—(Indianapolis & G. Rapid Transit Co. vs. Haines, 69 N. E. Rep., 188.)

KANSAS.—Injury to Employee—Demurrer to Evidence—Contributory Negligence.

1. A workman, while operating a hydraulic jack, expressed fears to the foreman in charge of the work that further pressure would cause an iron bar standing between the jack and a steel beam on which one end of the jack rested to fly out, and asserted that the arrangement was not safe. The foreman assured him to the contrary, and directed him to go ahead with the work. The workman was inexperienced in the use of such appliances, and testified that he believed the foreman. On resuming work the renewed pumping of the jack caused the end next the beam to turn the iron wedge, which flew out and injured the workman. Held that, in an action for damages by the latter against a corporation

in whose service the foreman was employed, a demurrer to the evidence interposed by the company was improperly sustained.

2. Where a master orders a servant into a situation of danger, and, in obeying the command, he is injured, the law will not charge him with contributory negligence, or with an assumption of the risk, unless the danger was so glaring that no prudent man would have encountered it, even under orders from one having authority over him.—(Wurtenberger vs. Metropolitan St. Ry. Co., 75 Pac. Rep., 1049.)

LOUISIANA.—Carriers—Electric Car—Injury to Passenger—Apprehension of Danger.

While plaintiff's son was a passenger on one of the electric cars of the defendant company, a broken wire fell, just before day, striking the dashboard of the platform of the car. The lights went out upon the falling of the wire, and this was immediately followed by a flash and an explosion, similar to the explosion of a firecracker, but louder. Neither the car nor any of the passengers were injured, nor was anyone frightened other than the plaintiff's son, who, standing near the open door at the rear of the car, under a first implse, ran to the back platform and jumped from the car (running at a high speed) to the ground, striking his skull, and fracturing it, from which injury he died. Plaintiff claimed that the accident was the cause of his son's death, and that he was not guilty of contributory negligence. Held that the character of the impending danger, or, at least, its apparent character, is to be considered. If one acts unreasonably, or rashly, or becomes frightened at a trivial occurrence, not calculated to alarm a reasonably prudent man, and thereby brings injury upon himself, there is no liability. The deceased must have acted upon reasonable apprehension. His conduct must have conformed to that of an ordinarily careful and prudent man under like circumstances. In considering whether there was justification for the passenger's action, it was proper to consider what the action of the other passengers was as part of the res gestæ, and was deemed prudent by those in the same situation having an interest to take the least and avoid the greatest danger. The speed of the car at the time was proper to be considered.—(Chretien vs. New Orleans Rys. Co., 37 S. Rep., 716.)

MARYLAND.—Street Railways—Collision With Team—Negligence—Contributory Negligence—Harmless Error.

1. One who, on arriving at the intersection of streets, looks, but seeing no street car, proceeds to cross the track, but before crossing, looks again, and, though seeing a car coming, hurries and tries unsuccessfully to cross before it arrives, is guilty of contributory negligence.

2. Any error in not submitting the question of negligence is harmless, contributory negligence being conclusively shown.

3. A motorman, seeing one driving a team toward the street car track, a short distance from an approaching car, and just before driving on the track, has a right to assume she will stop in a place of safety.—(Heying vs. United Rys. & Electric Co., of Baltimore, 59 Atl. Rep., 667.)

MARYLAND.—Street Railroads—Death of Passenger on Platform—Negligence—Evidence—Sufficiency.

1. In an action against a street railroad for damages for death, it appeared that deceased was struck by the footboard of a car while passing a platform on which he was standing; that deceased had ample space on the platform to stand without coming in contact with the footboard; that the car passed in perfect safety four other persons standing on the same platform before it reached decedent; that he had an uninterrupted view of the approaching car, and had an opportunity, from the passing of two previous cars, to notice the portion of the platform which would be covered by the footboard; that the platform had been in use for years, and had accommodated ten or twelve persons with perfect safety. There was no evidence that the motorman in charge of the car acted in a negligent or unlawful manner, though the car came up and passed at the rate of 30 m. p. h. to 35 m. p. h., and did not stop on signal to do so. Held, insufficient to establish negligence on the part of the street railroad.—(State, to Use of Egner et al., vs. United Railways & Electric Co. of Baltimore, 56 Atl. Rep., 789.)

MISSOURI.—Street Railways—Negligence—Collision with Team—Discovered Risk—Question for Jury.

1. Where a wagon which was being driven parallel to street car tracks was turned towards the tracks to cross them when an approaching car was 500 ft. away, and was struck by the car as it reached the second track, the question of whether the motorman could have avoided the collision after he saw the wagon, was for the jury.—(Moritz vs. St. Louis Transit Co., 77 S. W. Rep., 477.)

MASSACHUSETTS.—Street Railways—Injury to Passenger while Alighting—Negligence—Evidence.

The question of negligence and contributory negligence is for the jury, there being testimony that when plaintiff, a passenger on a street car, attempted to alight, it was not in motion, and no signal had been given to start; that she looked at the starter all the time while she was getting out; that he could have seen her if he had looked; that he gave the signal before she had alighted; and that the car was started when she had got as far as the running board, throwing her down.—(Meade vs. Boston Elevated Ry Co., 70 N. E. Rep., 197.)

MASSACHUSETTS.—Negligence—Proximate Cause.

Where a street railway company left a reel which had held feed-wire lying on its side in the untraveled portion of a highway, and some boys rolled it down the street, striking plaintiff's carriage and injuring her, the negligence, if any, of the company in leaving the reel in the highway, was too remote to entitle plaintiff to recover.—(Glassey vs. Worcester Consolidated St. Ry. Co., (two cases) 70 N. E. Rep., 199.)

MINNESOTA.—Carriers—Injuries to Passengers—Instructions—Requests—Duty of Counsel.

1. In an action against a street railway for injuries to a passenger, a request to charge that, if plaintiff jumped or stepped off the car while in motion, she could not recover, was properly refused, because it was indefinite as to the speed of the car on which the question of negligence in stepping therefrom would depend.

2. A complaint charged negligence in that the car, having stopped to permit plaintiff to alight, was suddenly started, and plaintiff was thrown to the ground. Defendant attempted to show that plaintiff was guilty of contributory negligence in alighting before the car had come to a stop. The court, in its charge, defined the general duties of defendant as a common carrier, defined contributory negligence, and then stated that there were two controlling issues in the case: First, was defendant negligent, and were the injuries proximately caused by such negligence? Second, was plaintiff negligent, and did her negligence proximately cause or contribute to her injury? After charging on the first phase of the case, the court stated that with reference to plaintiff's negligence the jury should consider where the car was when plaintiff arose from her seat, whether it was moving, and, if so, at what speed, and then continued that, if plaintiff got off the moving car, the question whether or not a person of ordinary care would have jumped off the steps of the car under the same circumstances under which plaintiff was placed was a question of fact for the jury. Held that the concluding clause of the charge did not, when considered with the entire charge, and especially with the portion directed to contributory negligence, inject a question not litigated into the case, and was not necessarily misleading.

3. Where a charge is otherwise clear and distinct on the issues submitted at the trial, language susceptible of a construction in conflict therewith must be called to the attention of the court by counsel if he deems it misleading.—(Cody vs. Duluth St. Ry. Co. et al, 102 N. W. Rep., 397.)

MISSOURI.—Street Railroads—Injuries to Travelers—Crossings—Speed—Negligence—Contributory Negligence—Last Clear Chance—Duty of Motorman—Actions—Instructions.

1. Where plaintiff, who was injured in a collision with a street car, testified that just before starting to cross the track he saw the car more than half a block away, and that the accident happened by the car running at a high rate of speed, and there was other evidence that the car was running at too high a speed at that point, which might have been the proximate cause of the accident, it was proper to submit the speed issue to the jury, though no witness undertook to testify how many miles an hour the car was running.

2. An instruction that if plaintiff, while approaching a street crossing, where he was struck by an approaching street car, saw the car, but misjudged either its distance or speed, and drove on the track when it was dangerous to do so, it was nevertheless the duty of the motorman to use all practical means to avoid a collision, after he had seen, or by exercising ordinary care might have seen, the danger of collision; and, if the motorman was negligent in that regard, which was the direct cause of the accident, and plaintiff was exercising ordinary care, he was entitled to recover—was not objectionable on the ground that plaintiff could not have been in the exercise of ordinary care if he misjudged either the speed or the distance of the car.

3. Where plaintiff, who was injured in a collision with a street car at a crossing, claimed that the car was half a block away when he attempted to cross, and that the injury was caused by the excessive speed of the car, and the failure of the motorman to check the same, plaintiff was entitled to recover, unless the jury found that the speed of the car was not excessive, or that plaintiff not only drove in front of the car so suddenly that the motorman could not save him, but did so without looking or listening, when he knew there was danger, considering the speed and proximity of the car.

4. Where the speed of a street car at a crossing was excessive, and because of that fact plaintiff was injured, when guilty of no

negligence in going on the crossing, he was entitled to recover, notwithstanding he drove on the track when the car could not be stopped before reaching him.

5. Plaintiff was not necessarily guilty of contributory negligence in driving on a street car track at a crossing when a car was so close and under such speed that it was bound to strike him, unless he saw the car, and realized that its speed was such that he could not cross the track before it would reach him, or by exercising ordinary prudence would have appreciated such fact.

6. Where plaintiff drove on a street car track without looking or listening, but the motorman of an approaching car, which struck plaintiff, was negligent in his watch, or in checking the car after seeing plaintiff's danger, plaintiff was entitled to recover notwithstanding his contributory negligence.

7. An instruction that, if plaintiff drove on a street car track so near the moving car which struck him that the motorman could not stop the car in time to prevent the collision, he could not recover, was objectionable as eliminating the factor of plaintiff's negligence in driving on the track.

8. The duty of a street railway motorman to control a car in order to avoid a collision does not arise exclusively when a person is on the track, but also obtains if his danger was apparent while he was approaching the track.

9. Where plaintiff, who was injured in a collision with a street car at a crossing, swore that he saw the car 150 feet south of the crossing, that his view was unobstructed, and that he attempted to drive diagonally across the track at a walk, such evidence sufficiently raised the question of the motorman's diligence in trying to stop the car before collision.—(Murray vs. St. Louis Transit Co., 83 S. W. Rep., 996.)

MISSOURI.—Street Railroads—Vehicles—Collisions—Negligence of Driver—Proximate Cause.

Plaintiff was driving a three-horse team by the side of a street car track, and in attempting to pass a vehicle in front of him drew nearer to the track without looking to the rear for a street car, when one rapidly approached from the rear, passed the rear hub of the wagon, then three feet away, struck the front hub, and killed the near horse, when it passed on, running a considerable distance before it was checked. Held that the driver's negligence in so turning toward the track, without looking to the rear, was the proximate cause of the disaster, for which defendant was not liable.—(Cicardi et al. vs. St. Louis Transit Co., 83 S. W. Rep., 980.)

MISSOURI.—Master and Servant—Injuries to Servant—Street Railroads—Barn Foreman—Vice Principles—Fellow Servants—Contributory Negligence.

1. A street railway barn foreman, whose duty it was to give orders with reference to the running of cars, with authority to lay off men for infraction of rules, directed plaintiff to take out a new car, which plaintiff stopped just outside the car shed, at a sandhouse, to get sand for his trip. While plaintiff was getting sand, the foreman got on the standing car and started it forward suddenly without signal, crushing plaintiff against the side of the sand bin. Held that the foreman was plaintiff's vice principal, and that his act in momentarily moving the car, instead of ordering another to do so, did not render his negligence in so doing that of plaintiff's fellow servant.

2. Where a street railway motorman was injured by the negligence of his foreman in moving the motorman's car while he was procuring sand, whether the motorman was guilty of contributory negligence in not carrying with him his controller handle, which he had removed from the socket, as required by a rule of the company, instead of leaving it lying on the controller, where it was easily obtainable by the foreman, was for the jury.—(Bien vs. St. Louis Transit Co., 83 S. W. Rep., 986.)

MISSOURI.—Carriers—Injury to Passenger—Ejection From Street Car—Complaint—Motion—Instruction—Statutes—Construction.

1. Rev. St. 1899, Section 592, provides that the complaint shall contain a plain and concise statement of the facts constituting a cause of action without unnecessary repetition, and section 629, providing that, in the construction of a pleading for the purpose of determining its effect, its allegations shall be liberally construed with a view to substantial justice between the parties, does not affect the fundamental requirements of good pleading. Hence a complaint containing indefinite and obscure allegations and legal conclusions is subject to attack by motion to make more specific.

2. In an action against a carrier for injury to plaintiff while a passenger, where the petition charged that after plaintiff had paid his fare the "car proceeded to a point near the new City Hospital, where it was stopped by a blockade, and plaintiff, with other fellow passengers, was transferred to" another line operated by defendant, and that after plaintiff had entered the car on that line, "and was lawfully on the car, the conductor in charge assaulted him," it was error to deny defendant's motion to make the petition more specific as to the manner in which the transfer to the second car was effected, and the facts under which he claimed to be lawfully on the car.

3. In an action against a carrier for ejection of a passenger, where the complaint embraced no charge of want of care by the conductor, but alleged that plaintiff's expulsion was wantonly effected, it was error to charge that if the jury found that the conductor used unnecessary force, and "carelessly" or wantonly injured plaintiff, their verdict should be for the plaintiff.—(Reubsam vs. St. Louis Transit Co., 82 S. W. Rep., 984.)

MISSOURI.—Street Railways—Collision With Vehicle—Personal Injuries—Contributory Negligence—Evidence.

Plaintiff, a driver of a hose cart, was driving rapidly in response to an alarm, and, when near an intersecting avenue on which was a street car line, noticed bystanders waving their hands, apparently to the operatives of a car. Plaintiff testified that when about a half a block away he got his team under control, that the car stopped just before crossing; that plaintiff then started to cross ahead of it, when the car suddenly shot forward, compelling him to turn his team to avoid a collision, and the cart struck a lamp post and injured him. Held that the evidence did not show undisputably that plaintiff was guilty of contributory negligence.—(O'Neill vs. St. Louis Transit Co., 83 S. W. Rep., 990.)

MISSOURI.—Street Railroads—Trespasser on Track—Negligence—Evidence—Sufficiency—Questions for Jury.

In an action against a street railroad, the evidence for plaintiff tended to establish the allegations of the complaint that deceased was killed in a tunnel through the negligence of the defendant's motorman in failing to keep a lookout, and that the tunnel, though belonging to defendant, and having warning signs posted at the entrances against admission, had been used for a passway by the public for five or more years immediately preceding the accident. The evidence for defendant tended to establish the contributory negligence of the deceased, and of plaintiff in permitting deceased, who was a person of weak and feeble mind, to go about without being properly guarded. Held sufficient to require the submission of the case to the jury, notwithstanding the fact that deceased was a trespasser.—(Fearons vs. Kansas City Elevated Railway Co., 79 S. W. Rep., 394.)

MISSOURI.—Carriers—Street Railways—Alighting Passengers—Negligence—Burden of Proof—Instructions—Trial—Limitation of Argument—Rules of Court—Discretion of Trial Judge.

1. Where a cause comes to the Supreme Court not on the short form allowed by statute, but on full record, showing the final judgment, the order allowing the appeal, the record entry of the filing of the bill of exceptions, and the full bill itself, an abstract accompanying the record, and containing a recital of these facts, is sufficient.

2. In an action for injuries to a passenger alighting from a street car, a charge that the burden of proof was on plaintiff to show that the car had stopped or slowed down, and that, while plaintiff was alighting, and before she had a reasonable time to alight, defendant's servants caused the car to move forward with increased motion, and thereby plaintiff was thrown on the street and injured, whereas, if defendant's servants had exercised a high degree of care, they would have prevented such injury, was not open to the objection of throwing on plaintiff the burden of proving that the sudden starting of the car could have been prevented by the exercise of the high degree of care incumbent on defendant.

3. Where a street car stops or slows down to such a degree that it is reasonably prudent for a passenger to attempt to alight, and she so attempts, but while alighting the car starts forward so as to throw her down, the stret railway is liable for a resulting injury, unless it can affirmatively show that such movement of the car could not have been prevented by the exercise of that degree of care which a carrier owes to a passenger.

4. In an action for injuries to a passenger alighting from a street car, where the defense was that the car had not stopped for plaintiff to alight, but was moving at a rate of speed that rendered it dangerous for her so to do, the burden was on plaintiff to prove that the car had stopped or had slowed down to a degree rendering it safe for her to alight, and that a new impetus was given to it while she was alighting.

5. In an action for injuries to a passenger alighting from a street car, there was no necessity for instructions on the care to be exercised by defendant in preventing the sudden starting of the car, where there was no claim by defendant that the car had started from a cause beyond its control, but its defense was a denial that the car had stopped for the passenger to alight, but was moving at a speed rendering it dangerous for her to so do.

6. A rule of court providing that in jury trials plaintiff, or, where he has the affirmative of the issues, defendant, may open and close, and that the court may announce how much time will be allowed on each side for argument, and that plaintiff may apportion

the time allotted to him between his opening and closing argument, but shall not consume more than one-half thereof in closing, is a reasonable regulation, and within the power of the court to make.

7. In an action for injuries to a passenger, where the only issue presented was whether or not the car had slowed down or stopped, and, before plaintiff had time to alight, started again with a jerk, and plaintiff was the only witness in her behalf, and defendant introduced but five witnesses, the law of the case being plain and fully covered by the instructions given, a 15-minute limitation for argument was proper.

8. The limitation of argument to the jury is a matter for the judicial discretion of the trial judge, and an abuse of that discretion must be clear, to authorize reversal thereof. Robinson, C. J., and Brace and Valliant, J. J., dissenting.—(Reagan vs. St. Louis Transit Co., 79 S. W. Rep. 435.)

MISSOURI.—Street Railroads—Pedestrians—Injuries—Contributory Negligence—Failure to Look—Speed—Humanitarian Doctrine—Evidence.

1. Where plaintiff was struck by a street car as she was passing diagonally across a street, and the car by which she was struck was plainly visible for at least two blocks, and she attempted to cross in front of the same without apparently noticing its approach, she was guilty of contributory negligence, though she testified that she looked and listened, but failed either to hear or see the car.

2. Where plaintiff testified that as she attempted to cross the street car tracks she neither saw nor heard the car, she was not entitled to recover on the ground that the car was running at an illegal rate of speed, and that, if it had been running at the speed prescribed by the city ordinance, she would have had time to have crossed the tracks in safety.

3. In an action for injuries to a pedestrian in a collision with a street car, evidence held not to justify submission of the case on the ground that defendant's servants saw, or might have seen, plaintiff in a position of danger in time to have prevented the injury.—(Reno vs. St. Louis & Suburban Ry. Co., 79 S. W. Rep. 464.)

MISSOURI.—Street Railroads—Collision with Vehicle—Vigilant Watch Ordinance—Acceptance by Company—Contradictory Instruction—Right to Allege Error—Absent Witness—Affidavit as to Testimony—Admission—Impeachment Without Predicate.

1. A vigilant watch ordinance need not be accepted by a street car company in order to bind it.

2. A party at whose request instructions are given cannot complain that they are conflicting.

3. Under Revised Statutes, 1899, Section 687, permitting an affidavit for continuance on account of the absence of a witness to be employed in lieu of his testimony, and providing that the opposite party may prove any contradictory statements made by the witness in relation to the matter in issue, evidence of such contradictory statements is admissible though no predicate for the impeachment of the absent witness can be laid.—(Nagel vs. St. Louis Transit Co., 79 S. W. Rep., 502.)

NEW HAMPSHIRE.—Street Railroads—Negligence—Evidence—Question for Jury—Child Non Sui Juris—Imputed Negligence—Absence of Fender—Instructions.

1. A child twenty-one months old is not chargeable with contributory negligence.

2. Negligence of the parent of a child non sui juris cannot be imputed to the child.

3. A street railway company must exercise ordinary care to prevent injury to a trespasser on its tracks after it has discovered his presence there, or where it could have discovered it by the exercise of ordinary care.

4. In an action against a street railroad company for negligence causing the death of a child, who was killed either by being struck by a car or by the moving of the car in an attempt to get him from under the trucks after having been struck, evidence considered, and held to justify submission of the issue of defendant's negligence.

5. In an action against a street railroad company for negligence causing the death of a child which was struck by a car, in which there was no evidence that failure to equip the car with a fender was negligence, it is error to permit plaintiff's counsel to state to the jury that ordinary care required that defendant should use fenders, and to instruct upon defendant's duty to equip its cars with safety appliances used by persons of ordinary prudence.

6. Under Pub. St. 1901, c. 191, Section 8, providing that cause of action for a tort survives decease of the injured party, and Section 12, declaring that in assessing damages the jury shall consider the probable duration of life and earning capacity, an instruction should be given in an action for negligence causing the death of a child that deceased would have been incapable of earning money for his estate during his minority.—(Carney vs. Concord St. Ry., 57 At. Rep., 218.)

NEW YORK.—Carriers—Injury to Passenger—Violent Start of Car—Pleading—Evidence—Instructions.

Where the complaint charged that as plaintiff was entering defendant's street car defendant negligently started it, so as to throw plaintiff against the car and injure her, and defendant did not object to evidence that the car was started with a violent jerk, a requested instruction that the violence of the jerk could not be considered on the question of negligence was properly refused.—(Plum vs. Metropolitan St. Ry. Co., 86 N. Y. Sup., 827.)

NEW YORK.—Carriers—Safety of Passengers—Station Platforms—Overcrowding.

Where a street railroad company had entire charge of a platform from which access was obtained to its cars, and permitted passengers to go on the platform only after having paid their fare, the company was guilty of negligence in permitting the platform to become so overcrowded that passengers could not enter the cars in safety, and was therefore liable for injuries to a passenger who was injured by being pushed by the crowd against the side of a car and then thrown violently into it.—(Dittmar vs. Brooklyn Heights Ry. Co., 86 N. Y. Sup., 878.)

NEW YORK.—Master and Servant—Injuries to Servant—Car Repairers—Rules—Knowledge—Verdict—Question for Jury—Contributory Negligence—Car Starter—Vice Principal—Negligence—Witnesses—Cross Examination—Rules—Signing—Custom—Evidence—Secondary Evidence—Damages—Excessiveness.

1. Where, in an action for injuries to a car repairer, plaintiff charged that defendant was negligent in failing to promulgate rules intended to protect plaintiff while engaged in work under the car, and defendant proved by a single witness that plaintiff had signed a private book kept by defendant's foreman, containing a rule requiring repair signs to be placed on cars in process of repair, while plaintiff denied that such book had ever been brought to his notice, or that he had ever signed the same, a verdict in favor of plaintiff on such issue was not contrary to the weight of evidence, though there were more witnesses who testified to the existence of the book than there were who denied it.

2. Where plaintiff, a car repairer, claimed that defendant was guilty of negligence in failing to provide rules for plaintiff's protection while he was working under cars in making repairs, and such rules, if any existed, had never been brought to plaintiff's knowledge, he was entitled to go to the jury on the question whether defendant had exercised reasonable care in providing him with a reasonably safe place to work, though defendant proved that the shop foreman had adopted rules, which were contained in a book in the foreman's office, but which were not shown to have been published or brought to the attention of plaintiff and other employees.

3. Where plaintiff, a car repairer, before going under a defective car to repair the same, removed the trolley pole from the wire, and, on his returning to work after luncheon, observed that the pole was still off the wire, and he was thereafter injured by the motorman starting the car without notice to him, plaintiff was not guilty of contributory negligence, as a matter of law, in not again looking to see whether the pole was off the wire, shortly before the accident, after he had gone a short distance for a piece of material to use in the work.

4. Where a car starter, whose duty it was to select street cars to be used, directed the motorman to start out a car which was defective, and which plaintiff was engaged in repairing, without notice to the plaintiff, the starter's negligence was that of a vice principal, and not a fellow servant of plaintiff, for which defendant was liable.

5. Where, in an action for injuries to a car repairer, plaintiff admitted that the car could not have been moved without placing the trolley on the wire—the negligence alleged consisting in moving the car without notice to plaintiff, or without the publication of rules to afford plaintiff reasonable protection—it was not error to refuse to permit defendant, on cross examination of the motorman who moved the car, sworn as plaintiff's witness, to prove that he put the trolley on the wire, and that the car was lighted when he went into the same.

6. Where, in an action for injuries to a car repairer, negligence was predicated on defendant's failure to promulgate rules for the protection of repairers, and defendant claimed that such rules had been adopted, and had been signed by plaintiff, which he denied, but no rules promulgated before the accident were introduced, it was not error to refuse to permit defendant to prove that it was customary in defendant's shop for persons to sign rules promulgated by the shop foreman.

7. Where, in an action for injuries to a car repairer, it was claimed that a book containing alleged rules made for the protection of car repairers had been lost, it was proper to refuse to admit the whole of a book of alleged rules, conceded to have been prepared

since the accident, which was claimed to be similar to the book lost, though admitted to contain rules which were not in the original.

8. A verdict for $8,000 for injuries to the foot of a car repairer, necessitating amputation, was not excessive.—(Quinn vs. Brooklyn Heights Ry. Co., 86 N. Y. Sup., 883.)

NEW YORK.—Street Railroads—Injury to Passenger—Liabilities—Care Required—Evidence—Degree of Care—Care of Motorman.

The U. Railroad Company operated a double-track railway in a city, and the S. Railway Company operated its cars over the other company's tracks under an agreement that the other company should keep the track and switches in repair. The U. Company was repairing a portion of its west-bound track, and both east and west bound cars were obliged to use the east bound track. A car of the U. Company, on which plaintiff was a passenger, while west bound, had crossed over to the east bound track, while an east bound car of the S. Company had been transferred to the west bound track, and had stopped with its east end about 10 ft. west of the west end of the cross-over. Some one threw the tongue of the switch so that the S. Company's car could run easterly on the west bound track, so as to permit the U. Company's car to pass over to that track, and continue westerly thereon. The motorman of the west car started it by letting off the brake, and the front truck passed the tongue of the switch, but the rear truck took the cross-over, throwing the rear end of the car against the U. Company's car, injuring plaintiff. Held that both companies were liable.

2. A street railway company is bound to use the utmost human skill in operating and keeping in repair its trains and switches to save a passenger from harm.

3. Where the first two wheels of a street car passed safely over a switch, and the other two wheels were displaced, whereby a passenger was injured, under the doctrine of res ipsa loquitur the street car company was bound to explain the displacement.

4. Where a car of a street railway company collided with a car of another street railway company, on which plaintiff was a passenger, whereby he was injured, the railway company on whose car plaintiff was not a passenger was bound to use towards him only reasonable and ordinary care under the circumstances confronting it at the time.

5. Where a motorman on a street car was using a switch in a manner in which it was not intended to be used, reasonable and ordinary care, to excuse the railway company from liability for injury to passenger on a car of another street railway company, required the motorman to proceed slowly and keep his car under control. Houghton, J., dissenting in part.—(Klinger vs. United Traction Co. et al, 87 N. Y. Sup., 864.)

NEW YORK.—Elevated Railroads—Injury to Passengers—Overcrowding Car.

An elevated railroad company, having power to limit the number of passengers who shall go onto the station platform and into its cars, is liable for injury to a passenger by the overcrowding of a car, though the passengers crowded on of their own accord, and were not pushed on by the guard. Woodward, J., dissenting.—(Viemiester vs. Brooklyn Heights Ry. Co., 87 N. Y. Sup., 162.)

NEW YORK.—Street Railroads—Passengers—Injuries—Negligence—Sufficiency.

Evidence that while plaintiff was attempting to board a street car, which had stopped in response to his signal, the car started, and plaintiff fell on the street, without showing in what manner the car started, and without showing that plaintiff's fall was caused by the starting of the car, was insufficient to show negligence on the part of defendant.—(Meyerowitz vs. Interurban St. Ry. Co., 84 N. Y. Sup., 233.)

NEW YORK.—Imputed Negligence—Fellow Servant—Street Railways—Crossing Accident—Contributory Negligence—Contributory Negligence.

1. The negligence of the driver of a wagon is chargeable to a fellow servant riding on the wagon with him.

2. Where one driving a wagon on approaching a street railway track saw a car 20 ft. distant, approaching rapidly, but drove on the track, he was guilty of contributory negligence.

3. Where one sitting on the tailboard of a wagon, which was going slowly toward a railroad track, saw a car approaching 20 ft. away, at a rapid rate of speed, but continued to sit where he was until he was thrown off by a collision, he was guilty of contributory negligence.—(Krintzman vs. Interurban St. Ry. Co., 84 N. Y. Sup., 243.)

NEW YORK.—Master and Servant—Injuries to Servant—Fellow Servants—Employers' Liability Act—Identity of Employer.

1. Plaintiff, a stret car conductor in defendant's employ, boarded a car during a temporary suspension of duty by reason of illness, and was directed by the conductor to ride on the front platform. While so riding without payment of fare, plaintiff was thrown from the car and injured by the negligence of the driver in suddenly loosening the brake. Held, that plaintiff was a fellow servant of the driver, and not entitled to recover.

2. The conductor of the car, on which plaintiff, a conductor off duty, was injured, was not a person whose sole or principal duty was that of superintendence, within Employers' Liability Act (Laws 1902, p. 1749, c. 600), Section 2, providing that the employer shall be liable for injuries to a servant resulting from the negligence of a co-employee exercising superintendence, etc., so as to entitle plaintiff to recover on the ground that such conductor was guilty of negligence in commanding plaintiff to occupy a dangerous position, on the front platform of the car.

3. Where a notice of injury served by plaintiff was addressed to defendant, and alleged that on the date of plaintiff's injury he was in defendant's employ as a street car conductor, he could not claim on the trial that the evidence showed that he was employed by a certain railway company other than defendant, and that there was no evidence that such company and defendant were identical.—(McLaughlin vs. Interurban St. Ry. Co., 91 N. Y. Sup., 883.)

NEW YORK.—Evidence—Competency—Conclusions of Witnesses—New Trials—Newly Discovered Evidence.

1. In an action against a street railroad for injuries to a passenger, which was tried on the theory that defendant was not liable unless the motorman or conductor knew, or should have known, that the wheels were off the track, and were negligent in not stopping the car, testimony offered by a witness who was accustomed to ride upon the cars over the place in question, and who was familiar with the noise and motion made by cars in their ordinary running upon the track, that the noise and motion of the car as it approached such place were not of the usual kind, was competent, and was not objectionable as calling for the conclusion or opinion of the witness.

2. An action against a street railway for injuries to a passenger was tried upon the theory that defendant's liability depended on whether or not its employees knew or should have known at the time of the accident that the car was off the track. A verdict was rendered for defendant, and on motion for a new trial plaintiff proposed to show by newly discovered evidence that witnesses who were riding bicycles directly behind the car at the time of the accident observed that the wheels were off the track, and that the conductor, while standing on the running board, stooped down to look at the wheels in such manner as to have seen that they were off the track. The testimony on the trial had been that the conductor was upon the running board, collecting fares, at the time of and before the accident. The newly discovered evidence was offered after three trials had been already had, but plaintiff's affidavits disclosed every effort in procuring witnesses, and sufficiently explained their failure to discover the particular witnesses for whose testimony the new trial was asked. Held, that the evidence was vital, and not necessarily inconsistent with that given on the trial, and, although it came late, a new trial should have been awarded on the ground thereof.—(Beers vs. West Side Ry. Co., 91 N. Y. Sup., 957.)

NEW YORK.—Carriers—Street Railways—Personal Injuries—Evidence—Competency.

1. Where, in an action against a street railway company for personal injuries received by a passenger in alighting, alleged to have resulted from a premature starting of the car, there was no evidence that he had signaled the conductor or motorman to stop, or that either of them had notice of his intention to alight, or that the car had been started again with a knowledge on their part that he was in the act of alighting, the complaint should have been dismissed.

2. In an action against a street railway company by a passenger for personal injuries received in alighting, plaintiff having testified on his own behalf in rebuttal, it was error to refuse to permit him on cross examination to answer a question as to whether he knew that, if he got off the car while it was in motion, he could not recover in the action.—(Grabenstein vs. Metropolitan St. Ry. Co., 84 N. Y. Sup., 261.)

WISCONSIN.—Street Railways—Personal Injuries—Person on Track—Contributory Negligence.

1. The driver of a buggy turned onto the track of a street railway company to cross the same at a point where an approaching car could be seen at a distance of 95 ft., and the buggy was still on the track when plaintiff, another occupant of the buggy, fearing injury from the approaching car, jumped out, sustaining injuries. The car, which was running at the rate of 7 m. p. h., stopped just as it touched the buggy. Held that the driver was guilty of contributory negligence as a matter of law.—(Hogan vs. Winnebago Traction Co., 98 N. W. Rep., 928.)

LONDON LETTER

(*From Our Regular Correspondent.*)

The London County Council has determined to acquire the lease which was granted by it some years ago to the North Metropolitan Tramways Company, and which still has about four and a half years to run. The electrification of these northern tramways will be commenced at once thereafter, and will involve the sum of £4,500,000, though this amount will extend over a period of about four years. The London County Council is already committed to an expenditure of about three million and a half pounds in the southern portions of London, so that when its present arrangements are completed the total outlay will be between £11,000,000 and £12,000,000, and the Council will be spending for the next four or five years approaching £2,000,000 a year. Such a vast sum for municipal expenditure of tramways, of course, met with considerable opposition and a great deal of criticism, but the schemes will doubtless be carried through, as the northern portions of London are greatly in want of a good system of tramways. The residents in these districts are getting exasperated at the delay in the electrification of the northern lines, as they can readily see the immense benefit which the residents of the southern portions of London are enjoying.

Some time ago we stated that the London County Council had placed orders for a number of new steamers to be used on the river Thames, and these will soon be ready for placing in service. The old steamboats which used to ply on the Thames never attracted much traffic, as they were slow, incommodious and irregular. It is the intention of the London County Council now to put on a first-class service of steamers capable of stemming the tide at a good pace. It is now announced that the Prince of Wales will perform the inaugural ceremony, and the date has been fixed for Saturday, June 17. The Prince of Wales will embark at Westminster Bridge at 3:30 p. m., upon one of the Council's new steamers, and will proceed to Greenwich Pier, and will return to the terminus at Westminster through Greenwich by the electric tramways of the Council.

The report by the Royal Commission on London Traffic is still delayed, chiefly owing to the new conditions which are now involved by the successful operation of the large number of motor omnibuses which have been put on the streets of London within the last six months. These are becoming a factor in the problem of transportation which cannot be neglected, and as actual data on their expense of operation, the proper amount to charge to depreciation, and the number of years they can be calculated to remain in good condition, are difficult to obtain, it may be yet some little time before the report is issued, though the taking of evidence is now completed. It is now hinted also as one of the results of the Commission that there will be the appointment of a board of control for matters relating to street traffic which would have the whole matter of the breaking up of streets and the questions of traffic entirely entrusted to it.

An important case will soon be tried in the courts as to whether tramway companies and municipal authorities owning and operating tramways in the United Kingdom are within their legal rights when undertaking the business of parcel delivery. As has been frequently mentioned in these columns, the city of Manchester has developed quite a large parcels delivery service, particulars of which have already been published. The authorities have instituted a vast system by which parcels can be collected from and delivered to any point in Manchester. Twenty-six depots have been inaugurated, and a large number of shops in various vicinities are also used as places from which to collect and deliver parcels. The smaller parcels are carried by the ordinary electric cars, though arrangements have also been made for very much heavier and bulkier packages, and the Corporation has provided a number of specially constructed vans for this purpose. A number of other cities are also doing very much the same class of business, but the Manchester Corporation has been singled out by Messrs. Sutton & Company, the well-known carriers, to provide a test case as to whether these companies have the right to act as collectors and deliverers of parcels or merchandise. A writ has accordingly been issued asking for a declaration that the authorities are exceeding their powers, and are not authorized to expend the city funds or receipts from the tramway undertaking for such purposes. A big fight will undoubtedly result, and will be watched with very great interest, though it will probably not come along for some time yet.

The third international electric tramway and railway exhibition will be held at the Royal Agricultural Hall from July 3 to July 14. The purpose of the exhibition is to enable municipal and other local authorities, tramway directors, managers and engineers, as well as the general public, to examine the latest apparatus designed for the equipment of tramways of all systems. More than eighty town councils will appoint official deputations to visit the exhibition, and it is expected that every important tramway will be represented.

Lord George Hamilton, M. P., and Mr. William H. Brown have been elected directors of the Metropolitan District Railway Company. Mr. Charles James Cater-Scott (chairman of the London and India Docks Company) has been elected a director and appointed chairman of the London United Tramways Company, Mr. Charles T. Yerkes having resigned the chairmanship in order to enable him to devote more of his time to the Metropolitan District Railway Company. Mr. William H. Brown has also been elected a director of the London United Tramways Company.

A meeting has been held of representatives of the Tramways Committees of the Corporations of Rochdale, Bury and Heywood to consider terms for working the electric tramcars in the borough of Heywood. They unanimously agreed that Heywood should lay the track and put up the overhead equipment, and that Bury and Rochdale should work the tramways at a charge of 4½d. per car-mile run, Heywood to supply the current and maintain the track, and Rochdale and Bury making themselves responsible for the overhead equipment. This arrangement is to continue for three years.

A pleasing ceremony took place recently at the Brighton Tramways Depot, when Mr. T. B. Holliday was the recipient of a silver bowl, suitably engraved, in view of his retirement from the position of engineer and general manager to the Brighton Corporation Tramways. As has already been announced, Mr. Holliday has been appointed manager of the Hastings tramways, which are rapidly approaching completion.

An interesting echo of the past history of the Central London Railway, the popular two-penny tube, will be found in our advertising columns, where the company is advertising for sale a number of electric locomotives. It will be remembered that the tube was first equipped with electric locomotives, but on account of the vibration they were discarded and the multiple-unit system adopted. May they soon find another and more suitable sphere of usefulness.

It has been decided to apply for powers to the Light Railway Commissioners this month for the construction of a cable railway up Lansdown Hill from the village of Weston, and to connect with the terminus of the Bath Tramway Company's system. Already a syndicate has been floated to make this application, and deal with the construction when powers have been obtained. The probable total cost of the scheme will not exceed £12,500, and the time taken to construct the line and put it in working order will only be about three months. It is proposed to lay down a double-track, one for up and one for down traffic, and to run a frequent service, especially in the summer and at holiday times.

The Southend Town Council has agreed to an arrangement whereby certain postmen when on duty can use the tramcars for half-price on the penny stages. The police officers stationed in Southend are to be allowed to use the trams free when on duty and in uniform.

As the first step towards electrifying the tramways within the district, it has been agreed at a special meeting of the Leyton Urban Council to purchase the Lea Bridge, Leyton, and Walthamstow portions of the North Metropolitan Tramway Company's system for £61,000. The company asked £68,473. The council's valuer said £56,145 was the proper figure, but advised that it would be better to go as far as £61,000 rather than incur the expenses of arbitration.

A reference was made in this letter last month to the electric power bills which are at present being considered by the House of Lords Committee, particularly to the Administrative County of London and District Electric Power Bill. No decision has yet been reached by the Committee, but it has resumed its hearings of the other power bills which are also being brought forward for more or less the same purpose, although none of the other bills is so extensive in character as that of the Administrative County. The Committee is now examining a bill of the North Metropolitan Electric Power Supply Company which is for extensions of its already existing rights, as the company has already been supplying electricity in bulk only within the counties of Middlesex, Hertfordshire and Essex. Another bill which is receiving consideration is also being brought forward by the City of London Electric Lighting Company; still another is the East London and Lower Thames Electric Power Bill. The Charing-Cross and City Company has also got a bill in Parliament for extensions of its system for power purposes, and altogether Lord Camperdowne's committee will be engaged for the next few weeks on hearing evidence in nine bills, all of which have been promoted to deal with the supply of electric power in and about the metropolis.

The construction of the Belfast Tramways is proceeding rapidly and successfully, and by the end of the summer nearly all of the work will be completed and the whole system in operation. One of the most important pieces of the work relating to the depots for the cars has been completed, and the Sandy Row Depot is now ready for the reception of the electric cars, some of which will be delivered before long. This depot had to be completely reorganized, and an intricate system of rails, points and crossings had naturally to be provided. This part of the work has been done by Hadfield's Steel Foundry Company, of Sheffield, and though it was a large, difficult and intricate piece of work, it has now been successfully put down. The street leading to the depot is an extremely narrow one, so that it is only possible to lay a single track upon it, and from this track twenty separate lines have to diverge in the entrances of the car shed. The whole of this work has been made of "Era" manganese steel, and it is interesting to note that the whole piece of work came out exactly according to the drawing.

As we took the trouble to point out some little time ago when the sucess of the electrification of the Liverpool & Southport Railway had been practically proved, one of the most favorable arguments for the electrification of certain steam railways was the immense amount of saving at the railway termini in big cities where there is a vast amount of traffic coming in and going out. We now notice that a number of the papers devoted to railway engineering are making a strong point of this, and many articles are appearing in the daily press also to that effect. It is now likely that several of the steam railway companies operating with huge termini in London will really find that they are forced to adopt electrification if for no other purpose than to save huge extensions to their already large termini. A. C. S.

PARIS LETTER

(*From Our Regular Correspondent.*)

The company formed to support the Berlier deep level tube scheme uniting the north and south of Paris, has been successfully floated, and there is nothing now to hinder the immediate execution of this work. At a recent meeting of the Paris-Metropolitan Railway, the president declared that that company had nothing to fear from the competition of this line, which will run in proximity with No. 4 line of the Metropolitan. It will be remembered that the stations of these two lines, where they approach, will be made contiguous, as far as possible, to facilitate interchange of passengers.

The tramway situation in general in France continues to make progress, even compared with 1904. Most of the larger companies show large increases in traffic receipts for the first few months of the present year.

Statements have been made to the American press during the recent railway congress, regarding the intentions of the Paris-Lyons and Mediterranean Railway Company in respect to the electrification of the Cannes-Vintimille section of their road. From an enquiry made at headquarters, it would appear that there is in contemplation the generation and transmission of energy at 10,000 volts single-phase. This current would be generated at Nice, by the power stations of the Compagnie d' Energie du Littoral, already in existence, and it is expected that this company will be taken over by the P. L. M. Company. The Auvert single-phase multiple-unit system would be employed on the section, and tests of this form of equipment have been made with satisfactory results. Although no date can be given regarding the transformation of this line, yet it is stated that it will be the first of the lines of the P. L. M. Company to be electrified.

With respect to the trackless trolley systems of traction, of which a few have been installed in France, Italy and Germany, it may be stated that the Siemens type of equipment is making a certain amount of headway in Germany and Italy. At Mannheim a very regular service is in existence, and at Bilstein another installation has just been placed in service. The train is formed of a locomotive and three trailers. The locomotive is equipped with two Siemens motors, each with an output of 30 kw maximum, taking current at 500 volts from the line, which is of course doubled. The motors have ball bearings, and have an elastic coupling and a Grisson-gear transmission, placed in an oil-tight gearcase. The motor-car has a weight of 6000 kg, and can haul four trailers on a level at the speed of 6 kw per hour, itself carrying a weight of 2000 kg. A number of these same trolley equipments, have also been placed in service at Castellamare, in Italy, and there is also the installation close to Paris, near Fountainebleau, of the same description. The average figure for the energy consumption per tonne-km appears to be generally agreed to be as follows:

Level, 200 watt-hours.
Grade of 2 per cent, 272 watt-hours.
Grade of 4 per cent, 345 watt-hours.
Grade of 6 per cent, 418 watt-hours.
Grade of 8 per cent, 490 watt-hours.
Grade of 10 per cent, 563 watt-hours.

In Spain, the great activity in traction circles, to which we referred some months ago is still maintained, and several companies have recently been formed for local railway and tramway enterprises. The Valencia Tramway Company has been taken over by the Spanish Thomson-Houston Company and will be electrically transformed as soon as possible.

The annual meeting of the Paris Metropolitan Railway Company was held in Paris on May 18. The system as now in service comprises a length of about 32 km of double track. The total receipts for 1904 were Frs. 20,662,297, and the expenses Frs. 8,779,645, giving a ratio of expenses to receipts of 42.49 per cent. The ratio for 1903 was 42.9, and in 1902, 41.52. The gross profits of the company were Frs. 11,882,652, and after deduction of the fixed rent, due to the city of Paris, as interest on the capital expenditure for tunnels and viaducts, etc., which is borne by the municipality, the net profits of the company amounted to Frs. 5,210,111. As there were but 30 km in service up to the end of 1904, the net profits per kilometer amounted to Frs. 200,104.

The total number of cars of all descriptions is 695, divided as follows: 249 motor cars and 369 trail cars, plus a certain number of both kinds placed in service since the end of 1904. Of these cars, considerably over a half are two-axle cars, and these are now being transformed into four-axle cars as fast as the service permits. This applies to the motor cars. As the cars are transformed a metallic motorman's cab is added instead of the former wooden compartment.

The dividend declared was the same as the previous year, i. e., 8 per cent on the paid-up capital. The special pension fund created in 1904 was further increased by Frs. 500,000, and a balance of Frs. 273,490 was carried forward.

SOUTHERN PACIFIC ELECTRIFICATION STORY OFFICIALLY DENIED

In the STREET RAILWAY JOURNAL of May 27, there appeared an item credited to the San Francisco News Bureau, which purported to be an authentic statement regarding the plans of the Southern Pacific Railroad for the electrification of some of its lines. Confirmation of the original story was sought from A. H. Babcock, electrical engineer of the company, who was mentioned in the clipping as having been called East to confer with the officials of the road in regard to plans for changes to be effected. Mr. Babcock says that this was not the object of his trip to the East, and that the subject of the electrification of the line between Sacramento and Reno was not even discussed. Mr. Babcock also says he knows nothing about the reported plan for a change of motive power between Bakersfield and Los Angeles. In fact, Mr. Babcock authorizes the STREET RAILWAY JOURNAL to say that the matters mentioned in the item referred to are not under consideration by the officials of the company.

NOTES FROM AUSTRIA-HUNGARY

A combination single-phase and direct-current electric railway is about to be constructed from Vienna to Baden. It will be about 15 miles in length. Both terminus sections will be operated direct current at 500 volts, and the intermediate portion with single-phase current. The railway will be built by the Austrian Siemens Schuckert Works, and motor cars will be used.

An interesting trial of the three-wire system is to be made on the Vienna Metropolitan Railway. The section selected for this service is that from Hauptzoll-Amt to the Praterstern. For this purpose the firm of Krizik at Prague will supply an electric locomotive. Direct current will be supplied on the three-wire system at 2 x 1500 volts, and the rails will serve as the middle conductor in such a manner as to place two overhead wires about each track.

Electric service is now insured on the local light railway lines Budapest-Szent Endre, Budapest-Czinkota and Budapest-Soroksár. This improvement has been projected for years, but was authorized only on Feb. 28, when the consent of the Royal Hungarian Ministry of Trade was secured. The system has about 35 miles of track.

Beginning with Jan. 1, 1904, the street railway companies of Budapest were obliged to stop carrying standing passengers. The ordinance occasioned great opposition from the companies at the time of its passage, but the 1904 reports do not show that the law exercised any unfavorable influence on the traffic and receipts. The number of passengers carried in 1904 by the Budapest Street Railway Company (electric service) was 45,325,512, or 2,043,759 more than in the preceding year. On the Budapest Electric City Railway Company, 24,296,292 passengers were carried, or 2,731,027 more than in 1903. The receipts amounted to Kr. 7,531,263, 287,119 net, and Kr. 3,678,974, 407,053 net, respectively.

FILING METHODS OF THE RAILWAYS PROTECTIVE ASSOCIATION

Several references have been published in these columns about the work of the Railways Protective Association, which was formed by Drummond's Detective Agency, of New York, to keep a live record of accident claims against electric and steam railways throughout the country. Each member of the association reports all accident cases coming to his attention, so that when another member reports a case he can be frequently informed whether the claimant is an old accident fakir or not.

The association has report cards of two kinds. One is a physical disability card showing the part injured, name and address of injured person, kind of injury, etc. The general nature of the injury can be indicated by using one of the arbitrary symbols presented on the card. The reverse of this card has front and rear views of a human skeleton, and a space for remarks.

The second card gives the particulars of the claim, such as name, address, injury and its date, medical examination by company's and claimant's doctors, amount asked and accepted, remarks, etc. The obverse of this card is arranged for a synopsis of the court record should the case go to trial.

Before card is filed, the files are examined for a previous record of the claimant, and if such is found, it is immediately sent to the company. The cards are filed under several headings, with references and cross references, so that if the name is changed, some other methods of identifying claimant will disclose his identity in nine cases out of ten. Each month a bulletin will be sent to all members of the association, giving an account, with full particulars of the fake claims reported. It will amount, in a way, to a sort of rogues' gallery, and where photographs can be obtained, they will be printed in the bulletin.

TWO COMING RAILROAD CONVENTIONS

The American Railway Master Mechanics' Association and the Master Car Builders' Association will hold their 1905 meeting at the Oriental Hotel, Manhattan Beach, New York City. The master mechanics will hold their sessions on June 14, 15 and 16, and the car builders on June 19, 20 and 21. J. W. Taylor, 658 The Rookery, Chicago, is secretary of both societies.

ANOTHER CROSSTOWN TUNNEL FOR NEW YORK—OTHER TRACTION MATTERS

Fourteenth Street has been formally decided upon as the route for the second crosstown subway by the Rapid Transit Commission. Thirty-Fourth Street was decided upon as the route for the first at the meeting last week. The subway, as planned, will extend from the North River straight across Fourteenth Street as a four-track route to a point between Avenues B and C where the connection will be made with a bridge loop, which is to connect the Williamsburgh, Manhattan and Brooklyn Bridges. This loop will tunnel the East River to Williamsburgh opposite Fourteenth Street. The Fourteenth Street line will have two spurs running down the West Side. One will run from Ninth Avenue, two tracks, through Ninth Avenue, Greenwich Street, Liberty and William Streets to the proposed Old Slip tunnel under the East River to Brooklyn. The other will carry two tracks down University Place, Wooster, Canal and Centre Streets, to connect at Brooklyn Bridge with the so-called bridge loop.

The proposed Fort Hamilton subway route is to be changed. As originally laid out it would have terminated in the Interborough subway in Brooklyn, now building. The Rapid Transit Commissioners thought that no bidder would want to compete for such a route except the Interborough, so it has been decided to include a loop in the plans so that instead of being carried into the Interborough subway, the Fort Hamilton route may be carried around on a spur in Fourth Street and Atlantic Avenue to Borough Hall, where it can be connected with any of the proposed extensions under the East River.

The Transportation Reform League of Brooklyn has asked the Rapid Transit Commission to urge a connection between the elevated roads of Manhattan and Brooklyn with a five-cent interborough fare. The plan would extend the tracks of the Third Avenue line at the City Hall and Brooklyn Bridge by curving them into the bridge structure and connecting the tracks with those of the Brooklyn Rapid Transit system. An intertraffic agreement between the Interborough and the Brooklyn Rapid Transit Company would be necessary.

BURNETT, CUMMINGS & COMPANY FAIL

Burnett, Cummings & Company, of Boston, largely interested in the promotion of electric railway companies, have failed. The creditors of the firm include seventy-one banks and trust companies. The firm's liabilities are $1,714,369, and the assets are of uncertain value. The cause of the failure was the building and financing of the Concord & Boston Street Railway, the Middleborough, Wareham & Buzzard's Bay Street Railway, the Lowell & Boston Street Railway, and the Bristol County Railway Company. These lines were in thinly settled districts and were unable to make suitable connections. The roads were placed in the hands of receivers, upon which the equity of the stock was lost, and the notes given by the roads became valueless, entailing large losses to the firm. The secured creditors number eighty-seven and the unsecured eighty-one. There are thirty-two Massachusetts savings banks in the list of creditors and thirteen Massachusetts National banks. The firm of Burnett, Cummings & Company is composed of Archie C. Burnett and Charles C. Cummings, Jr. It was the successor of C. S. Cummings & Company, and had been in business three years.

FROM ROCHESTER TO ELMIRA

Preliminary work in connection with the plan to build an electric railway from Rochester to Elmira, N. Y., a distance of 120 miles, has all been completed, and the announcement is made in Rochester that the Rochester & Southern Railroad, the promotor of the line, will apply at once to the Railroad Commissioners for the right to build. A construction company, to be organized by interests identified with the Rochester & Southern, will be incorporated in a few days to carry out the actual work of building the line. In reality the road will be an air line, but a number of spurs will be built. A summary of the distances follows: Rochester to West Brighton, 2 miles; West Brighton to West Henrietta, 7.5 miles; West Henrietta to East Avon, 9.5 miles; East Avon to Lakeville, 5 miles; Lakeville to Conesus Lake, 9.5 miles; Lake Conesus to Scottsburg, 4 miles; Scottsburg to Dansville, 9.5 miles; Dansville to Perkinsville, 4 miles; Perkinsville to Wayland, 3 miles; Wayland to Atlanta, 8.5 miles; Atlanta to North Cohocton, 3 miles; Cohocton to Wallace, 3 miles; Wallace to Avoca, 3 miles; Avoca to Kanona, 10.5 miles; Kanona to Bath, 4 miles; Bath to Savona, 7.5 miles; Savona to Campbells, 4 miles; Campbells to Coopers, 5 miles; Coopers to Painted Post, 3 miles; Painted Post to Corning, 5 miles; Corning to Horseheads, 14 miles; Horseheads to Elmira, 7 miles; total, 120 miles.

As regards equipment, the road will be up to the standard of interurban practice. There will be a central power house at Wayland, and ten sub-stations along the line. The rolling stock will comprise 15 passenger cars, 10 passenger and express cars, 2 electric locomotives and five freight locomotives. The passenger cars will be 45 feet long. A large freight business is expected to be developed, and a freight terminal convenient to shippers will be built in Rochester. A site for this depot is said to have been secured on South Avenue.

The line will enter Rochester over the South Avenue line, reaching Main Street at the South Avenue corner. Somewhere in this vicinity on South Avenue a waiting room and ticket office will be opened, and somewhere south of Court Street a huge freight station will be constructed. It is planned to run trains on an hourly schedule, making stops at all stations. Between these hours will be a number of express trains running direct between Rochester and Elmira and making stops only at the larger villages. These express trains will probably make the trip of 120 miles between Rochester and Elmira in five hours, an average of 24 miles an hour, including all stops. As the line will be over private right of way, except in cities, it will be possible to maintain this schedule.

The first section to be constructed will be from Rochester to Conesus Lake, a distance of about 30 miles, and a large excursion business is planned to this point next summer. After this start progress will be rapid. The engineers claim the road from that point can be opened at the rate of ten miles a month, so that the entire main line can be ready for operation between Rochester and Elmira in the spring of 1907.

The directors of the company will be County Clerk James L. Hotchkiss, Walter B. Duffy, Hon. William A. Sutherland, Benjamin E. Chase, Stephen J. Hollister and Fedor Willimek, of Rochester; County Judge William W. Clark and O. F. Lieders, of Wayland; J. M. Edwards, of Dansville, and George A. Englert, of New York.

NEW JERSEY ENTERTAINS BROOKLYN

The officers of the Brooklyn Rapid Transit Company, the officers of the employees' association of that company and the regular uniformed band of employees all went to Jersey City Thursday evening, May 25, at the invitation of the Public Service Corporation, which operates the trolley lines in Jersey City, Newark, Paterson, Hoboken and other places. Newton W. Bolen, formerly of the Brooklyn Rapid Transit Company, but now superintendent of divisions one and three of the Public Service Corporation, was the host. He acted the part well, too.

In April, Mr. Bolen, accompanied by several officers of his company, came to Brooklyn to inspect the work of the local association of employees, and so impressed was he with the scope and thoroughness of the organization that has been so successfully built up in that city, that the idea occurred to him of applying to the local associations in Jersey City, Newark and other places where his company operates, some of the ideas that appealed to him as suitable for application in specific cases on the Jersey system. Above all, the Brooklyn band appealed to Mr. Bolen, and in extending an invitation to Secretary Geo. W. Edwards, of the Brooklyn association and the officers of the company to visit him, he included the members of the band.

Making up the party from Brooklyn were: Geo. W. Edwards, secretary of the Employees' Association; W. B. Graham, superintendent of surface lines; W. O. Wood, superintendent of the elevated lines; Geo. F. Wolfram, superintendent of the Brooklyn Bridge division; Harry Pistor, superintendent of Bergen Street division; Mr. Tiffany, the secretary to Mr. Edwards, and representatives from the general office in Montague Street. The private car "Amphion" was used to convey the party from the East New York Club House of the association to Fulton Ferry, where the ferry to New Jersey was taken.

In Jersey City the party was met by Mr. Bolen, Albert Eastman, superintendent of employment of the Public Service Corporation; A. J. Bliss, Geo. H. Duck and Jos. Downs, all division superintendents of that company. The private car "Public Service" and a special car were in waiting at the terminal in Montgomery Street, and in these the trip was made to the Montgomery Street car houses. Here the arrival of the Brooklynites was signalled by the firing of rockets and the burning of red fire. Part of the Montgomery Street car house is set aside as a club room for the employees, and here were the Brooklyn railroad men entertained, and did they entertain. An excellent vaudeville programme was provided, to which all the employees of the company and their families had been invited. The band of employees from Brooklyn also did their share, and their efforts were appreciated. The encores were many, and their playing demonstrated to the New Jersey officials and their friends that Brooklyn has a truly wonderful organization in the band, which is the only one of its kind in the United States. To conclude the entertainment, Mr. Bolen thanked the officers of the Brooklyn Rapid Transit Company for the interest they displayed in fellow craftsmen by coming to New Jersey, and then called upon Mr. Wolfram, the vice-president of the Brooklyn association, for a speech. Mr. Wolfram, in responding, explained to the audience just what the work is that is being done in Brooklyn for railroad men, and told what the methods of management are that have built up in that city in less than three years an organization with a surplus of $13,000, a main club house valued at more than $40,000, and seven branches in the depot buildings, each of which is fitted up on the general lines of the main building.

Mr. Bolen entertained the entire party at luncheon after the close of the entertainment.

A feature of the Brooklyn Rapid Transit Employees' festival at Luna Park, to which reference has previously been made in the STREET RAILWAY JOURNAL, was the appearance on Saturday evening, May 27, of the band in a special concert. The freedom of the park was extended to the band, and at 9 o'clock there was rendered a programme of nine numbers which included popular selections. W. S. Mygrant, bandmaster, acted as leader. After the concert the members of the band were entertained at luncheon.

An order for 100 large double-truck cars has been placed by the Pittsburg Railways Company. President J. D. Callery, of the company, authorized the announcement and said the cars would be put into service this summer. The order was given to the St. Louis Car Company, and makes 460 new cars the company has purchased within the past two years. The cars will be closed and of the same type as the large double-truck cars now in use there. They will be 44½ ft. long, with 61 ft. platforms, and will comfortably seat 44 people.

ELECTRICITY ON THE READING

At a conference held in Philadelphia last week to discuss the maintenance of one of the local stations in Philadelphia, Geo. F. Baer, president of the Reading Railroad, told a committee of residents that he contemplated adopting electricity as a motive power for urban and suburban service, though retaining steam for the movement of expresses into and out of the city. It is the purpose of the Reading Company to build an elevated structure in Ninth Street, Philadelphia, capable of carrying four tracks, the prime object being to avoid grade crossings. After it is completed, the operation of electric trains on the outermost tracks will be begun, and platforms and ticket offices will be provided at intervals of only a few blocks.

DECISION IN FAVOR OF WESTCHESTER ROAD

Attorney-General Mayer, of New York, has denied the application made by Anthony Stumpf, a stockholder in the New York & Port Chester Railroad, through his attorneys, Professor Charles A. Collin and Samuel Untermyer, asking that action be brought in the name of the State to obtain a judgment that the New York, Westchester & Boston Railroad never existed and never acquired the right, privilege or franchise to construct, operate or maintain a railroad. The Westchester railroad was represented by William B. Hornblower and Edward Lauterbach. The case at issue has been before the public in various phases for a number of years, during which the Westchester has never acted on its franchise, while the Port Chester, possessing all other necessary consents, has been held up by the Board of Aldermen.

Dick & Robinson, with the attorneys for the Westchester company, made a statement soon after the decision was announced declaring that the actual work of construction on the company's proposed four-track, third-rail electric railway from New York to Port Chester, a distance of 27 miles, would begin on June 5. The construction work is to begin, so the statement announces, in several places within the city limits. William Barclay Parsons is to pass on all plans of the company.

IMPORTANT PURCHASE ON LONG ISLAND

The control of the New York & Long Island Traction Company has just been purchased by Sanderson & Porter, the well-known consulting engineers in New York. It has not been announced whether the purchase has been made for their own account or in behalf of outside capitalists. The New York & Long Island Traction Company owns about 30 miles of track extending between Mineola, Freeport, Hempstead, Jamaica and Brooklyn, where it connects with the elevated and surface lines of the Brooklyn Rapid Transit Company. The company was originally called "The Mineola, Hempstead & Freeport Traction Company," but this name was changed by law in September, 1902, to "The New York & Long Island Traction Company." A modern power station has recently been built at Rockville Center. The gross income for the year ending June 30, 1904 was $59,709. The company has $750,000 common stock, and $250,000 preferred stock. The road was built by the Cleveland Construction Company. The president of the New York & Long Island Traction Company is Geo. A. Stanley, and two of the directors are Will Christy and H. E. Andrews, of Cleveland.

THE FIRE AT THE WORKS OF THE OHIO BRASS COMPANY

On Wednesday, May 24, the plant of the Ohio Brass Company at Mansfield, Ohio, was partially destroyed by fire. Fortunately, the office and records, the finishing and machine shops and its insulating building, cooper shop and pattern vault were not burned, so that the majority of the company's force is actively working. Considerable raw and finished stock was destroyed, but the company is continuing shipments of that which was uninjured. The men are not only continuing work in the uninjured buildings, but are also working under temporary sheds upon the grounds, and in addition, the molders are already busy in adjacent plants which have loaned their molding rooms. The bond department will continue in a neighboring factory, pending the completion of the new permanent buildings which the company will erect at once.

Much raw material is in transit, part of which, fortunately, was en route before the fire, and part the result of rush orders placed since the fire. Extraordinary efforts are being made to avoid inconveniencing customers, and indulgence is asked for such brief delay as is inseparable from the confusion incident to the conditions. The Ohio Brass Company intends to break all records for quick recovery from the effects of the fire, and proposes to make the interruption only momentary.

NEW YORK FRANCHISE TAX VALID

The validity of the special franchise tax law of 1899 of the State of New York, under which the franchises of many public utilities are subjected to ad valorem taxes, has been sustained by the Supreme Court of the United States. Justice Brewer delivered the opinion Monday, May 29.

He said that the decision of the Court of Appeals settled that there was nothing in the law or proceedings in the case in conflict with the constitution of New York. He added that it was not contended by the plaintiff in error that there was any constitutional objection to the taxation of franchises. "The right to subject them to a share in the burden of supporting the government is conceded," he said.

Taking up the contentions in the case, he said the main one was that this tax legislation impaired the obligation of contracts, and added:

It must be borne in mind that presumptively all property within the territorial limits of the State is subject to its taxing power.

It would not be doubted that if a grant of specific, tangible property like a tract of land and the payment therefor was a gross sum, no implication of an exemption from taxation would arise. Whether the amount was large or small, greater or less, if the payment was distinctly the consideration of the grant, that which was granted would pass into the bulk of material property, and, like all such property, be subject to taxation. Nor would this result be altered by the fact that the payment was to be made annually instead of by a single sum in gross. If it was real estate, it would be equivalent to the conveyance of the tract subject to the ground rent, and the guarantee taking the title would hold it liable to taxation upon its value. If this be true in reference to a grant of tangible property, it is equally true with respect to a grant of a franchise, though intangible, is none the less property, and oftentimes property of great value. Indeed, growing out of the conditions of modern business, a large proportion of available property is to be found intangible things like franchises.

Regarding the contention that when the public grants a privilege on condition of the payment of an annual sum, the contract implies that the public shall exact no larger amount for that privilege, and that to impose a tax is simply increasing the price which the grantee is called upon to pay for the privilege. Justice Brewer said:

We are not disposed to undervalue the force of these situations, but it would be giving them undue significance to hold that they are potent to displace the power of the State to subject to the burdens of taxation property within its limits. The word tax is not infrequently used in a general sense as denoting a burden or charge, and not in a strict legal sense of a charge or burden imposed by the State for the purpose of revenue for its support.

The language quoted from section 46 indicates the desire of the Legislature to deal equitably with the corporations holding these franchises. Surely the manifestation of this desire cannot be construed into a repudiation of power. These charges are not called taxes, but are spoken of as in the nature of taxes, and the Legislature, recognizing the equitable force of the claim based thereon, provided that corporations be given credit for sums thus payable. We are of opinion that no contract right of the relator was impaired by the legislation in question.

The opinion overruled the point that the tax law denies to the relator the equal protection of the law, and due process under the Fourteenth Amendment to the Constitution of the United States. It closed with the statement:

The court finds no error in the decision of the Supreme Court of New York, and it is therefore affirmed.

The accompanying table of the unpaid franchise taxes of all of the different corporations in the five boroughs of New York City is taken from the New York "Tribune" of May 30.

FRANCHISE TAXES OF CORPORATIONS UNPAID

(For the Years 1900 to 1904, Inclusive, Distributed as to Years and Boroughs.)

	1900	1901	1902	1903	1904	Totals
Manhattan	$2,827,515.17	$3,490,107.59	$3,550,368.52	$2,415,778.01	$2,740,732.67	$15,024,501.96
Brooklyn	854,218.20	786,714.53	843,298.90	591,307.03	659,187.98	3,734,726.64
The Bronx	130,044.53	159,355.65	181,718.24	121,815.86	151,969.97	744,904.25
Queens	71,551.72	126,962.24	111,045.81	75,681.85	80,195.61	465,437.23
Richmond	48,949.43	40.437.99	34,740.08	20,652.49	21,713.14	161,493.13
Total tax	$3,927,279.05	$4,603,578.00	$4,721,171.55	$3,225,235.24	$3,653,799.37	$20,131,063.21
Interest cost to June 1, 1905 (approximated)	1,282,400.00	1,176,600.00	876.700.00	373,800.00	168,300.00	3,877,800.00
Total tax and interest	$5,209,679.05	$5,780,178.00	$5,597,871.55	$3,599,035.24	$3,822,099.37	———
Grand total						$24,008,863.21

The announcement was made on Wednesday, May 31, that Paul Morton, Secretary of the Navy, will, upon his retirement from the cabinet on July 1, become associated with Metropolitan Street Railway interests in New York, as the head of a construction company to be organized to build the subway lines for which the company expects to secure contracts.

SUPPLY MEN'S EXHIBIT AT THE NEW YORK STATE CONVENTION

At a meeting of the executive committee of the Street Railway Association of the State of New York, held in Elmira on May 16, a committee on exhibits was appointed to have charge of all matters pertaining to the exhibition of the supply men at the coming convention of the association, which will be held at Ft. William Henry Hotel, Lake George, on June 27 and 28. B. B. Nostrand, Jr., president and general manager of the Peekskill Lighting & Railroad Company, Peekskill, N. Y., was appointed chairman of this committee with the following committeemen: Major H. C. Evans, of the Lorain Steel Company; Fred. V. Green, of the Westinghouse Traction Brake Company, and Henry N. Ransom, formerly of the National Electric Company.

Mr. Nostrand, as chairman of the supply men's committee, issued a call for a meeting of manufacturers and supply men which was held at the Manhattan Hotel, New York City, on Wednesday, May 31, at 3 o'clock, p. m., the purpose of the meeting being to take such action as might appear desirable to promote the exhibition of railway supplies at the annual meetings of the Street Railway Association of the State of New York and increase the interest and attention of the delegates attending.

The meeting was attended by representatives of about twenty of the leading manufacturing and supply houses. The following plan was outlined and adopted. Each firm represented at the convention will be asked to pay a registration fee of $15, which will entitle one representative of that firm to a banquet ticket and one badge. Any firm having more than one representative in attendance will be asked to register these men and pay the cost of banquet tickets and a slight additional charge to cover cost of badges. This latter also applies to guests.

Ample quarters have been provided for exhibition space in the Casino near the hotel, and H. N. Ransom will be in attendance at the Ft. William Henry Hotel, Caldwell, N. Y., a few days in advance of the meeting, and material may be consigned in his care. A charge will be made to exhibitors to cover the actual cost of space, including lights. A diagram and the cost per square foot of exhibition space will be published at an early date.

It is the intention of the Street Railway Association of the State of New York to appoint a supply men's manufacturers' committee each year to look after entertainment and exhibit matters in conjunction with the New York State Street Railway Association. One member of this committee will be appointed by its chairman to act with the banquet and entertainment committee of the association. H. N. Ransom has been appointed to occupy that position for this year.

The committee urges the earnest co-operation of supply men and manufacturers in the matter of exhibits and attendance at the Lake George convention, and especial effort will be made by the Street Railway Association to make this particular convention a feature.

All communications with respect to exhibits at Lake George should be addressed to B. B. Nostrand, Jr., president and general manager, Peekskill Lighting & Railroad Company, Peekskill, N. Y., who is chairman of the committee.

PROGRAMME FOR NEW YORK STATE CONVENTION

The papers to be read at the Lake George Convention of the Street Railway Association of the State of New York, June 27 and 28, are as follows: "Municipal Ownership," by W. J. Clark, Schenectady; "Publicity," by J. H. White, Boston Elevated Railway; "Types of Interurban Cars," by J. N. Shannahan, Gloversville; "Medical Examination of Employees," by F. H. Peck, Schenectady; "Question Box," conducted by C. B. Fairchild, Jr., associate editor, STREET RAILWAY JOURNAL.

On May 31, the announcement was made in Chicago that a definite proposal had been received from the local traction companies looking to a settlement of the street railway situation. This offer is understood to embrace a proposition for the immediate turning over of the two local systems to the city, with the alternative of private operation under city supervision. The information to hand is indefinite, and conveys no idea of the significance of the proposal.

MAY MEETING OF THE NEW ENGLAND STREET RAILWAY CLUB

The last monthly meeting of the New England Street Railway Club was held at the American House, Boston, on May 25, and about 125 members were in attendance. Dinner was served at 7 o'clock, and then followed a brief business meeting, several new members being elected. The feature of the evening was an address on "Building of State Highways," by W. E. McClintock, chairman of the Massachusetts highway commission. Mr. McClintock described at length the building of State highways, and in the course of his address said: "You know from 1892 how the street railroad interests of this State have increased. You know how you have increased from a mileage of 600 miles at that time to 2600 at the present time. Why is it that you could spend $100,000,000 to build those railroads? Simply by taking in the nickel of each person, you are able to pay not only the interest, but you are able to pay dividends a little in excess of $3,000,000 a year; the dividends themselves amounting to a small part of what you get from the fare. I think a little over one-half cent an individual is practically the dividend part of the income. Now what we claim of the good road principle is that if private individuals can afford to spend $100,000,000 to build these ways of steel, the carrying of people for five cents apiece for a distance long or short as the case may be, we can afford out of the funds of the Commonwealth to build a highway which shall enable the farmer to carry his produce to market, the manufacturer to carry his crude materials to the mill, and his manufactured articles back to the railroad station at a less cost; that will enable the farmer to carry or send his children to school in proper shape; that will enable them to interchange socially, not through the summer months, but throughout the entire year, and all at the cost of the State.

That cost has been magnified by a great many people. We have spent $6,000,000 in the last 12 years for this purpose, while you have been spending $100,000,000 to build your street railways. That $6,000,000 has been a cost to the tax-payer of the Commonwealth on an average, $1.17 on each thousand dollars of valuation, and that is all. For that we have given you 654 miles of road just as good as you will find in Rome, in France, in England, in Germany or anywhere else, if I am to believe the word of those who have ridden over those roads. Still more has been the result of this work. The towns of the Commonwealth, noting the character of the roads built by the commission and paid for out of the funds of the Commonwealth, have taken up the work, and they have built out of their own funds 700 miles of road, equal in almost every respect to the 650 odd miles built by the Commonwealth. So that, as a result of the work of the commission, there are between 1300 and 1400 miles of good hard roads to-day in the Commonwealth that did not exist at the beginning of our work 12 years ago, and all, as I say, for the small sum of $1.17 on a thousand."

Many views were shown by the aid of a stereopticon.

RECEIVER FOR HUDSON VALLEY RAILWAY

Justice Henry T. Kellogg has appointed District Attorney Jarvis P. O'Brien, of Troy, N. Y., receiver of the Hudson Valley Railway Company on application of Daniel P. Halpin. Mr. Halpin sued the Hudson Valley Railway Company and the Merchants' Trust Company, of New York, to foreclose on forty-five bonds of the railway company which he holds and which are secured by a mortgage given to the Merchants' Trust Company. The receiver's bond is fixed at $100,000. George R. Salisbury, of Saratoga, is appointed referee in the proceedings to sell the railway after it has been advertised for six weeks. Justice Kellogg provides that any bondholder or creditor who has a lien may participate in the judgment. The trust company is the principal creditor. The railway has twenty days to pay off the claim.

MANUFACTURE OF CURTIS TURBINES AT RUGBY

On May 12, upon invitation of the British Thomson-Houston Company, a party of technical newspaper representatives visited the works of that company at Rugby. All the departments were inspected, but particular attention was given to that devoted to turbines, in which a large number of Curtis turbines were in course of construction. The British Thomson-Houston Company has been manufacturing these machines for several years and has now a large bay devoted exclusively to this class of work. The company has recently issued Bulletin No. 2060, describing the Curtis turbine in detail, and giving a number of views of the interior of the shops at Rugby.

PERSONAL MENTION

MR. M. M. NASH, whose paper on "Repairs of Car Equipments" was presented at the May meeting of the Indiana Electric Railway Association and was reprinted in the issue of this paper for May 20, is superintendent of the Railway Department of the Terre Haute Traction & Light Company, and not master mechanic of that company, as erroneously given in the report of the meeting.

MR. JAMES DALRYMPLE, superintendent of the city tramway system, of Glasgow, Scotland, arrived in New York on Saturday. Mr. Dalrymple is on his way to Chicago to give Mayor Dunne, of that city, the result of his experience with the municipal lines in Glasgow, and to discuss with the Mayor policies to be adopted by Chicago in its effort at municipal ownership. On the evening of the day of his arrival in New York, Mr. Dalrymple was entertained at dinner at the Hoffman House by twenty-one members of the Municipal Ownership League, of New York. Mr. J. G. Phelps Stokes presided.

MR. THEODORE WATERS has begun in the June number of "Pearson's Magazine" a series of interesting articles on "The Profession of Getting Hurt." Mr. Waters exposes the varied methods of accident fakirs, most of which are only too well known to the street railway manager. It is an encouraging sign, however, that the general public should learn through the medium of a popular magazine that perjury is just as heinous an offense when committed against a corporation as against an individual. It is to be hoped that Mr. Waters' articles will have a healthy effect on public sentiment in properly judging fake accident cases.

THE ANNOUNCEMENT THAT MR. E. M. HERR, general manager of the Westinghouse Air Brake Company, has been appointed first vice-president of the Westinghouse Electric & Manufacturing Company, will be the subject of much congratulatory comment in the railroad and engineering professions. These congratulations will not be confined to the individual himself, but will extend largely to the Westinghouse Electric Company and to the man whose name it bears, through whose wisdom and forethought the appointment is made. Mr. E. M. Herr began his career as a messenger boy for the Western Union Telegraph Company at Denver, Colo., afterwards becoming an expert telegraph operator in commercial work. He later became station master and operator at the Deer Trail station of what is now the Union Pacific Railway. While in this service he prepared for college and was graduated from the Sheffield Scientific Shool of Yale in 1884. Upon leaving college he went to the Chicago, Milwaukee & St. Paul Railway as special apprentice in the motive power department at West Milwaukee. Later he entered the motive power department of the Chicago, Burlington & Quincy Railroad as mechanical draftsman and test engineer, where, owing to his former experience, he was made superintendent of telegraph of the system. His splendid work in this department, especially during the Burlington strike, brought him to the attention of the operating department, whereupon he was made division superintendent of the lines East of the Missouri River. In 1889 he went to the Chicago, Milwaukee & St. Paul as master mechanic, which position he held until 1892, when he was called to the superintendency of the Grant Locomotive Works, at Chicago. He was later sent to Europe by financial interests to report upon and establish a locomotive building plant in Russia. Upon the completion of this important mission he returned to America, and in 1896 became general manager of the Gibbs Electric Company, at Milwaukee. Soon after his connection with this company he resigned to become assistant superintendent of motive power of the Chicago & Northwestern, under Robert Quayle. In 1897 he went to St. Paul as superintendent of motive power on the Northern Pacific, which position he retained until 1899, when he was called to Pittsburg as assistant general manager of the Westinghouse Air Brake Company. Due to his marked ability as an engineer, works manager and executive, he was promoted to the position of general manager of this company. Mr. Herr is about forty-five years of age, and through his unusual ability and charming personality, which latter quality often passes for genius, but which in his case only supplements his splendid talents, has risen from a messenger boy to the senior vice-presidency of one of the foremost manufacturing establishments in the world. The organization of the Westinghouse Electric & Manufacturing Company in other respects remains as heretofore, viz: Mr. George Westinghouse, president; Mr. E. M. Herr, first vice-president; Mr. Frank H. Taylor, second vice-president; Mr. L. A. Osborne, third vice-president; Mr. Newcomb Carlton, fourth vice-president; Messrs. G. W. Hebard and W. M. McFarland, acting vice-presidents; C. A. Terry, secretary and counsel; Mr. T. W. Siemon, treasurer; Mr. James C. Bennett, auditor; Mr. B. G. Lamme, chief engineer; Mr. Chas. F. Scott, consulting engineer.

TABLE OF OPERATING STATISTICS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. * Including taxes. † Deficit. ‡ Decrease due to strike.

Company	Period	Total Gross Earnings	Operating Expenses	Net Earnings	Deductions From Income	Net Income, Amount Available for Dividends
AKRON, O. Northern Ohio Tr. & Light Co	1 m., Apr. '05	68,838	39,565	29,273	22,917	6,356
	1 " " '04	63,064	37,504	25,560	22,467	3,094
	4 " " '05	261,728	150,285	111,444	91,668	19,777
	4 " " '04	241,665	140,373	96,291	90,068	6,223
AURORA, ILL. Elgin, Aurora & Southern Tr. Co	1 m., Mar. '05	33,520	20,926	12,593	9,233	3,360
	1 " " '04	34,544	23,239	11,304	9,133	2,171
	9 " " '05	338,906	194,815	144,091	83,539	60,552
	9 " " '04	344,630	207,578	137,052	82,641	54,411
BINGHAMTON, N. Y. Binghamton Ry. Co	1 m., Apr. '05	19,129	11,414	7,715	------	------
	1 " " '04	17,306	11,721	5,585	------	------
	10" " '05	211,119	114,006	97,113	------	------
	10" " '04	195,153	108,316	86,837	------	------
CHICAGO, ILL. Aurora, Elgin & Chicago Ry. Co	1 m., Mar. '05	35,230	23,505	11,725	------	------
	1 " " '04	24,382	18,692	5,690	------	------
	9 " " '05	352,129	198,729	153,399	------	------
Chicago & Milwaukee Elec. R. R. Co	1 m., Apr. '05	35,827	16,507	19,320	------	------
	1 " " '04	28,063	12,188	15,875	------	------
	4 " " '05	114,543	61,193	53,349	------	------
	4 " " '04	87,936	43,678	44,258	------	------
CLEVELAND, O. Cleveland, Painesville & Eastern, R. R. Co	1 m., Apr. '05	16,105	10,640	5,465	------	------
	1 " " '04	14,962	9,499	5,463	------	------
	4 " " '05	54,794	38,483	16,311	------	------
	4 " " '04	53,344	36,823	16,522	------	------
Cleveland & Southwestern Traction Co	1 m., Apr. '05	39,404	25,375	14,029	------	------
	1 " " '04	30,012	24,777	5,235	------	------
	4 " " '05	141,789	95,710	46,079	------	------
	4 " " '04	119,180	94,305	24,875	------	------
DETROIT, MICH. Detroit United Ry	1 m., Apr. '05	390,623	*239,122	151,501	91,059	60,442
	1 " " '04	348,502	*217,813	130,689	88 303	42,386
	4 " " '05	1,450,720	*915,576	535,144	367,752	167,392
	4 " " '04	1,282,496	*874,241	408,255	355,973	52,282
DULUTH, MINN. Duluth St. Ry. Co	1 m., Apr. '05	52,878	27,798	25,080	16,755	8,325
	1 " " '04	51,647	26,881	24,766	16,523	8,243
	4 " " '05	194,785	110,258	84,527	66,942	17,585
	4 " " '04	187,109	114,810	72,299	65,849	6,450
FORT WORTH, TEX. Northern Texas Traction Co	1 m., Apr. '05	53,431	28,890	24,541	11,601	12,939
	1 " " '04	43,770	23,253	20,517	9,750	10,768
	4 " " '05	187,652	109,906	77,746	42,244	35,502
	4 " " '04	160,985	96,829	64,157	38,325	25,832
HAMILTON, OHIO. Cincinnati, Dayton & Toledo Trac. Co	1 m., Mar. '05	37,674	22,253	15,421	16,498	†1,077
	1 " " 04	33,768	27,535	6,233	16,326	†10,093
	10" " '05	422,574	244,107	178,468	168,538	9,930
	10" " '04	423,834	244,810	179,024	161,414	17,610
HANCOCK, MICH. Houghton County St. Ry. Co	1 m., Mar. '05	‡458	20,475	†20,017	3,527	†23,544
	1 " " '04	14,022	12,394	1,627	3,403	†1,776
	12" " '05	188,171	145,558	42,613	41,112	1,502
	12" " '04	186,867	127,206	59,661	35,815	23,846
HOUSTON, TEX. Houston Electric Co.	1 m., Mar. '05	38,837	25,708	13 129	8,646	4,483
	1 " " '04	30,106	19,469	10,637	7,934	2,703
	8 " " '05	282,369	181,805	100,555	66,995	33 559
	8 " " '04	260,190	181,796	78,394	60,981	17,413
LONDON, ONT. London St. Ry. Co.	1 m., Mar. '05	13,959	11,501	2,459	2,124	335
	1 " " '04	11,937	10,147	1,790	2,271	†481
	3 " " '05	39,012	33,182	5,829	6,172	†342
	3 " " '04	32,662	30,251	2,412	6,058	†3,647
MILWAUKEE, WIS. Milwaukee El. Ry. & Lt. Co.	1 m., Apr. '05	255,887	125,942	129,946	74,975	54,971
	1 " " '04	254,046	127,219	126,827	73 300	53 527
	4 " " '05	1,002,502	515,832	486,669	294,619	192,050
	4 " " '04	1,010,774	544,619	466,155	293,804	172,351
Milwaukee Lt., Ht. & Tr. Co	1 m., Apr. '05	42,574	19,820	22,754	19,539	3,214
	1 " " '04	31,001	17,089	13,912	15,712	†1,800
	4 " " '05	154,263	78,674	75,589	75,906	†318
	4 " " '04	118,020	70,600	47,420	60,647	†13,227
MINNEAPOLIS, MINN. Twin City R. T. Co	1 m., Feb. '05	321,451	170,281	151,170	97,325	53,845
	2 " " '05	672,571	345,595	326,976	194,650	132,326
	1 " Mar. '05	361,732	172,766	188,966	97,325	91,641
	3 " " '05	1,034,303	518,361	515,942	291,975	223,967
MONTREAL, QUE. Montreal St. Ry. Co	1 m., Apr. '05	202,946	125,350	77,596	22,454	55,142
	1 " " '04	186,473	125,372	61,100	20,837	40,264
	7 " " '05	1,439,392	986,233	453,158	140,905	312,253
	7 " " '04	1,309,152	891,706	417,446	126,435	291,012
MUNCIE, IND. Muncie, Hartford & Ft. Wayne Ry. Co	1 m., Apr. '05	13,946	*7,401	6,544	4,167	2,378
	1 " " '04	13,556	*7,764	5,792	5,000	792
	4 " " '05	51,469	*27,489	23,981	16,667	7,314
	4 " " '04	49,057	*28,403	20,654	16,000	4,654
OAKLAND, CAL. Oakland Traction Consolidated	1 m., Apr. '05	122,247	57,003	65,243	------	------
	1 " " '04	107,333	50,603	56,730	------	------
	4 " " '05	443,000	236,206	206,792	------	------
	4 " " '04	383,886	205,528	178,359	------	------
San Francisco, Oakland & San Jose Ry. Co	1 m., Apr. '05	47,412	19,641	27,771	13,425	14,346
	1 " " '04	34,359	14,857	19,502	8,231	11,271
	4 " " '05	‡135,608	61,262	74,345	35,550	38,796
	4 " " '04	157,614	62,869	94,744	47,244	47,501
OLEAN, N. Y. Olean St. Ry	1 m., Mar. '05	9,358	5,874	3,485	2,890	595
	1 " " '04	7,365	4,337	3,029	2,452	576
	9 " " '05	85,300	43,327	41,973	23 900	18,073
	9 " " '04	76,031	37,110	38,920	22,069	16,852
PEEKSKILL, N. Y. Peekskill Lighting & R. R. Co	1 m., Apr. '05	8,386	*5,289	3,097	------	------
	1 " " '04	6,911	*4,858	2,053	------	------
	10" " '05	96,682	*56,307	40,375	------	------
	10" " '04	91,761	*55,036	36,726	------	------
PHILADELPHIA, PA. American Rys. Co	1 m., Apr. '05	114,938	------	------	------	------
	1 " " '04	104,785	------	------	------	------
	10" " '05	1,205,994	------	------	------	------
	10" " '04	1,152,392	------	------	------	------
ROCHESTER, N. Y. Rochester Ry. Co	1 m., Apr. '05	130,516	67,841	62,675	27,475	35,200
	1 " " '04	116,586	64,951	51,635	26,467	25,168
	4 " " '05	526,185	296,800	230,185	108,508	121,677
	4 " " '04	457,431	271,369	186,062	105,052	81,010
SAN FRANCISCO, CAL. United Railroads of San Francisco	1 m., Apr. '05	590,503	------	------	------	------
	1 " " '04	569,609	------	------	------	------
	4 " " '05	2,231,575	------	------	------	------
	4 " " '04	2,112,966	------	------	------	------
SAVANNAH, GA. Savannah Electric Co.	1 m., Mar. '05	44,555	27,449	17,106	10,554	6,552
	1 " " '04	39,371	24,812	14,560	10,034	4,525
	12" " '05	551,818	320,365	231,453	126,998	104,454
	12" " '04	525,992	305,287	220,705	121,361	99,344
SEATTLE, WASH. Seattle Electric Co	1 m., Mar. '05	194,204	135,708	58,496	24,862	33,634
	1 " " '04	183,837	130,070	53 767	23,542	30,225
	12" " '05	2,351,730	1,620,859	730,870	300,132	430,738
	12" " '04	2,170,805	1,525,361	645,444	278,122	367,321
SYRACUSE, N. Y. Syracuse R. T. Co	1 m., Mar. '05	77,153	44,914	32,239	20,471	11,768
	1 " " '04	70,538	42,428	28,110	20,529	7,581
	9 " " '05	660,546	378,868	281,678	182,842	98,836
	9 " " '04	626,571	364,576	261,995	182,627	79,368
TERRE HAUTE, IND. Terre Haute Tr. & Lt. Co	1 m., Mar. '05	45,827	32,800	13,027	9,726	3,300
	1 " " '04	42,024	31,392	10,633	9,246	1,386
	12" " '05	578,730	371,036	207,693	113,482	94,211
	12" " '04	498,739	329,409	169,330	95,965	73,365
TOLEDO, O. Toledo Rys. & Lt. Co	1 m., Apr. '05	147,159	*79,153	68,006	41,765	26,241
	1 " " '04	134,420	*77,391	57,029	41,969	15,060
	4 " " '05	578,074	*300,148	277,926	170,149	107,777
	4 " " '04	534,641	*301,158	233,483	166,843	66,640
YOUNGSTOWN, O. Youngstown-Sharon Ry. & Lt. Co	1 m., Mar. '05	43,733	*24,308	19,425	------	------
	1 " " '04	37,619	*23,230	14,389	------	------
	3 " " '05	125,784	*72,335	53,449	------	------
	3 " " '04	110,631	*69,386	41,245	------	------

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Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 8000 *copies are printed. Total circulation for* 1905, *to date,* 189,100 *copies—an average of* 8222 *copies per week.*

Loose Window Sash

Ten years ago it was the exception rather than the rule to find a closed electric car which was not uncomfortably noisy on account of the rattling of window sash, especially in winter when there is a small amount of frozen dirt on the track. Fortunately, this condition no longer exists, and it is now the exception rather than the rule to find such noisy cars. Certain it is that this noise was formerly a source of serious discomfort to passengers. As heavier and better constructed cars came into use, the rattling of windows has become less noticeable, but now that many companies have heavy equipment which has been in use several years, it is time to begin to look out again for the windows. Window panes set in rubber should have the rubber renewed after a few years' use, after the life of the rubber is gone so that it is hard. By looking after these and many other little details in the maintenance of cars, they can be kept as comfortable for passengers as when new, even if not presenting quite the same appearance.

Semaphores on Interurban Switches and Platforms

It is certainly of importance in the operation of a high-speed interurban road that all signals be of such a nature that they can be clearly distinguished from a distance by the motorman. The high-speed interurban in many cases has not graduated from the street railway stage of development sufficiently that the signals which are provided are of much real value. All switches on the main line of a high-speed road should have signals which can easily be read 1500 ft. away by night or day, otherwise the motorman is going by guess rather than by positive knowledge. To be sure, many steam roads are operated with switch targets which cannot be distinguished at a great enough distance to stop a fast passenger train should some careless employee have left them open. That, however, is no reason why such risks should be taken by the electric road. It costs little if any more to put up semaphore signals at switches and platforms than it does to put up any other kind of signals, and these signals can be positively read by the motorman at a great distance. Some interurbans are making it a practice to light switch targets and semaphores at night; others do not. As described in the account of the meeting of the Ohio Association this week, the lighting can be done economically with 300-volt low-efficiency incandescent lamps, two in series, making a pair for each turn-out. Where such signals are not lighted at night, the practice can only be justified on the ground that the present arc headlights light the track far enough ahead so that the position of the switch signal can be seen.

It is strange that so few interurban companies have adopted the plan of placing signals of some kind at way platforms for the use of passengers in signaling cars to stop. The absence of these signals is likely to be a fruitful source of skidded flat wheels as the result of the attempts of the motorman to stop quickly after he has distinguished a passenger waiting on a platform to take a car, or it may mean loss of time by running by passengers at night and being obliged to back to the platform. The lack of these signals may even mean the missing of a passenger altogether by a motorman, in which case not only is a certain amount of direct revenue lost from the passenger at that time, but there is a still larger indirect loss because of its deterrent effect on those who would otherwise take cars at night at way stations. It is true that the way platform business of most interurban companies is not a large percentage of the whole, but even supposing it is insignificantly small, the presence of semaphore signals on these platforms enables the motorman to run with more confidence and make better time between important points because of a positive knowledge that, unless the signals are against him at way platforms, there need be no slacking of speed.

Standard Wheel-Tread Problems

Every year the cry is becoming more urgent from the large interurban centers for some united action regarding standard wheel treads and flanges. The Master Car Builder's standard tread and flange as used on steam roads is advocated by some managers, but the interurban roads operating over city tracks which have adopted and put in operation such wheels are very scarce. It is questioned by some whether a flange as deep as the M. C. B., which is 1⅛ ins. in depth, is necessary. However that may be, it is certain that the use of such wheels at present would play havoc with the special work on city tracks over which they might operate. Some city companies, with a view to the future, are laying all special work with flangeways large enough to take M. C. B. flanges. It should be realized, however, that as soon as this is done the track immediately becomes unsuited to the use of the narrow wheel treads and small flanges commonly used on city cars. Large flangeways permit the city cars with narrow wheel treads to go over special work in such a way that only a fraction of the narrow wheel tread bears on the track. The result of the concentration of so much weight on the outer part of the narrow wheel tread of the city car is to wear out the special work much more rapidly than it should wear with the wheels of wide tread. It is furthermore likely to be fruitful of chipped and broken wheel treads on city cars.

As pointed out in the paper read by Thomas B. McMath, of the Indianapolis Traction & Terminal Company, before the Indiana Electric Railway Association, and which appeared in the Street Railway Journal for Jan. 21, 1905, changes in city special work to accommodate wheel treads and flanges approaching the M. C. B. standard should be accompanied with corresponding changes of wheels on the city cars. Otherwise, according to Mr. McMath, the wear on the special work by the city cars would be so great as to more than pay for the changing of all the wheels on the city cars in a very short space of time. There has been a gradual widening of wheel treads on city cars in a number of cities, and there is really no reason why ultimately M. C. B. treads should not be feasible. The question that ought to be decided soon is whether this or some other section is the standard toward which we ought to work. The width of a wheel tread on a city system is something which must be increased gradually a sixteenth of an inch at a time, for there are many places where the paving extends slightly above the rail head, and the car wheels, if they overhang the rail head, must bear against the paving to some extent until the paving has been worn down even with the rail head. In cities where much grooved and girder rail has been laid it will be a long time before a flange 1⅛ ins. deep can be adopted, although it would be feasible in many cases to make flanges wider than at present without greatly increasing the depth.

The life of straight line track should be limited only by the amount of rail that can be worn away before the wheel flanges begin to ride on the tram of the girder or the bottom of the groove on rails of that type. If a T-rail construction is used there is no such limit on the life of a rail, as the rail can then be used until the amount of material in the head has been reduced so as to render the track unfit for use. At the present day the joint should not in any way limit the life of the rail, as with care, joints can be obtained by any electric railway company for use in paved streets which will permit the rail to wear practically as long at the joint as anywhere else. If this is not the case it is a serious reflection on the original construction of the track. The life of the rail being dependent on the amount that can be worn off the head before the flanges strike the girder or bottom of the groove, it is evident that any addition to the depth of the wheel flange materially decreases the life of every foot of rail of the track. Of course, it is true that in a number of places where a grooved rail has been laid, interurban cars are entering the city by traveling on their wheel flanges fully as much as on the treads of their wheel. While this may be permissible for a few interurban cars when operated slowly, it is dangerous for high-speed cars and uneconomical to the last degree. The power required is greatly increased and the wear on both the wheel and rail is excessive.

The present tendency is undoubtedly to increase the size of wheel treads and flanges gradually and to alter the special work to correspond to these new sizes. The change is necessarily slow and consists of adding a little here and a little there as opportunity offers. But it is a long way from even a ⅞-in. depth of flange to the M. C. B. standard of 1⅛ in., with corresponding greater width. Few who talk of it realize what a change it would mean in city track work. However, it is likely that the present practice toward larger treads and flanges will continue until the M. C. B. standard is reached. The M. C. B. standard is probably a little larger than is necessary for electric roads, but as electric and steam roads gradually work into more harmonious relations and into actual consolidations, uniformity of wheel treads may be an advantage.

A Progressive Organization

The Ohio Interurban Railway Association is proving itself one of the strongest and most progressive of the State street railway organizations. On account of the close interconnection of the various lines which are members of the association, the progressive enthusiasm of its officials and the frequency of its meetings, it has been able to accomplish results in the way of securing uniformity of operating practice and for the general welfare in a manner which has been impossible with other associations whose members are not so closely allied. Our readers are familiar with the success of the association in securing uniformity of operating rules, the sale of interline tickets, through checking of baggage and the sale of books of interchangeable coupons. The coupon book plan is now assured of success through the announcement at the recent Cleveland meeting of the signing of the most important system in the central part of the State, embracing five interurban lines. A number of other roads in that district have been waiting the action of this system, so that by the time this issue is in print the plan will probably be in force on nine-tenths of the interurban mileage in the State. A prominent lake boat line has also asked to join the agreement, and there is every prospect that one of the strongest Indiana systems will join the Ohio fold, in which event it will be only a matter of a short time before most if not all the other lines in that State will follow.

Perhaps of even greater importance from a financial standpoint is the concerted action taken by the association towards making the rate of 2 cents per mile uniform throughout the State. Three Dayton roads and two Columbus lines heretofore using a basis of from 1.5 to 1.75 cents have agreed to increase rates, leaving only a very few lines in that State with a rate below 1.8 cents per mile. With the example presented, there is reason to believe that the aims for a uniform base of 2 cents will soon be an accomplished fact. Embodied in the resolution mentioned was a clause making a minimum rate of 10 cents except where a lower rate is provided for in municipalities. This is based upon the well-founded idea that the modern interurban train is no longer a street car, and that it cannot profitably be stopped and started for 5 cents. Several of the roads have decided to place this rule in force at once, and others will watch the outcome of their action with great interest. With other important plans in view, the Ohio roads have reason to be congratulated upon the success of their movement.

As to the Trackless Trolley

There have been already a number of serious attempts to get the trackless trolley into commercial operation. But so far as we are able to ascertain, nothing substantial has yet been accomplished in this country, and only on a very limited scale abroad. The two latest propositions are in Nahant and Brookline, Mass., neither of them having reached anywhere near the operative stage. The trackless trolley, whatever may be one's judgment as to its commercial merits, is not a thing to be turned down offhand in these days of automobiles. It is merely an automobile system with a continuous source of energy, being thereby limited in its sphere of action, but relieved of the necessity of carrying a prime mover with it. To a certain extent it combines the objectionable features of both trolley cars and automobiles, but it is not without some compensating advantages. To begin with, it is certainly able to obtain an adequate supply of energy for all its reasonable needs at all times and to utilize that energy efficiently. It can certainly command as much power per unit of weight as a big touring car, while not attempting anything like the same speed. It certainly, too, should drive over any grade that any other vehicle would be likely to attempt, although, as a commercial proposition, steep grades should be rather out of its line. Its best hold is evidently on level and good roads, and only upon such is it in a fair way to be reasonably economical.

As compared with an ordinary trolley system, the trackless variety begins by eliminating the ordinary fixed right of way, which is a very considerable item of cost—something like half of the total or more. If this were a clear gain, the proposition would be very attractive. The rolling stock of the trackless trolley is, however, at a serious disadvantage. It is likely to be much more expensive than the usual rolling stock of similar carrying capacity, both in first cost and in depreciation. The tire question is a specially grave one. Rubber tires have been found to be a practical necessity in all road work, and they are both costly and far, very far, from durable. The tire cost alone might run as high as 2 cents or 3 cents per car-mile, aside from all other repairs. As to power, no road, even of the best construction, requires so little from vehicles as does a well-laid track. For similar speed the traction coefficient, which measures the power needed, should be three or four times as great on the road as on track, and hence the cost of energy per car-mile must be increased greatly.

On the other hand, in comparison with ordinary automobiles, the trackless trolley ought to show fairly favorable costs. The ordinary gasoline car uses fuel costing in the neighborhood of $50 per ton, and even crediting it with its extra thermal energy as compared with coal, its greatly increased efficiency of utilization and its freedom from electrical losses, it still makes a dubious showing. The labor cost ought to be much less also, because it takes very much less skill to operate an electric automobile than one operated by gasoline. This has been demonstrated in the motor cab service in New York City, where, in spite of their tremendous weight and expense, the electric cabs are kept in operation because they can be driven by "motormen," while the gasoline cab requires the "chauffer" at two or three times as large wages. The curious traveling power stations recently introduced would make a much less favorable showing.

It is not a mere question of power or labor cost, however, that is before us. In repairs the ordinary automobile ought not to be much, if at all, inferior to the trackless trolley, and as a winner of traffic it ought to have a material advantage. The absence of track applies to both classes, but the need of overhead structure and the attendant requirement of a special franchise of a somewhat unpopular sort is a serious disadvantage of the class under discussion.

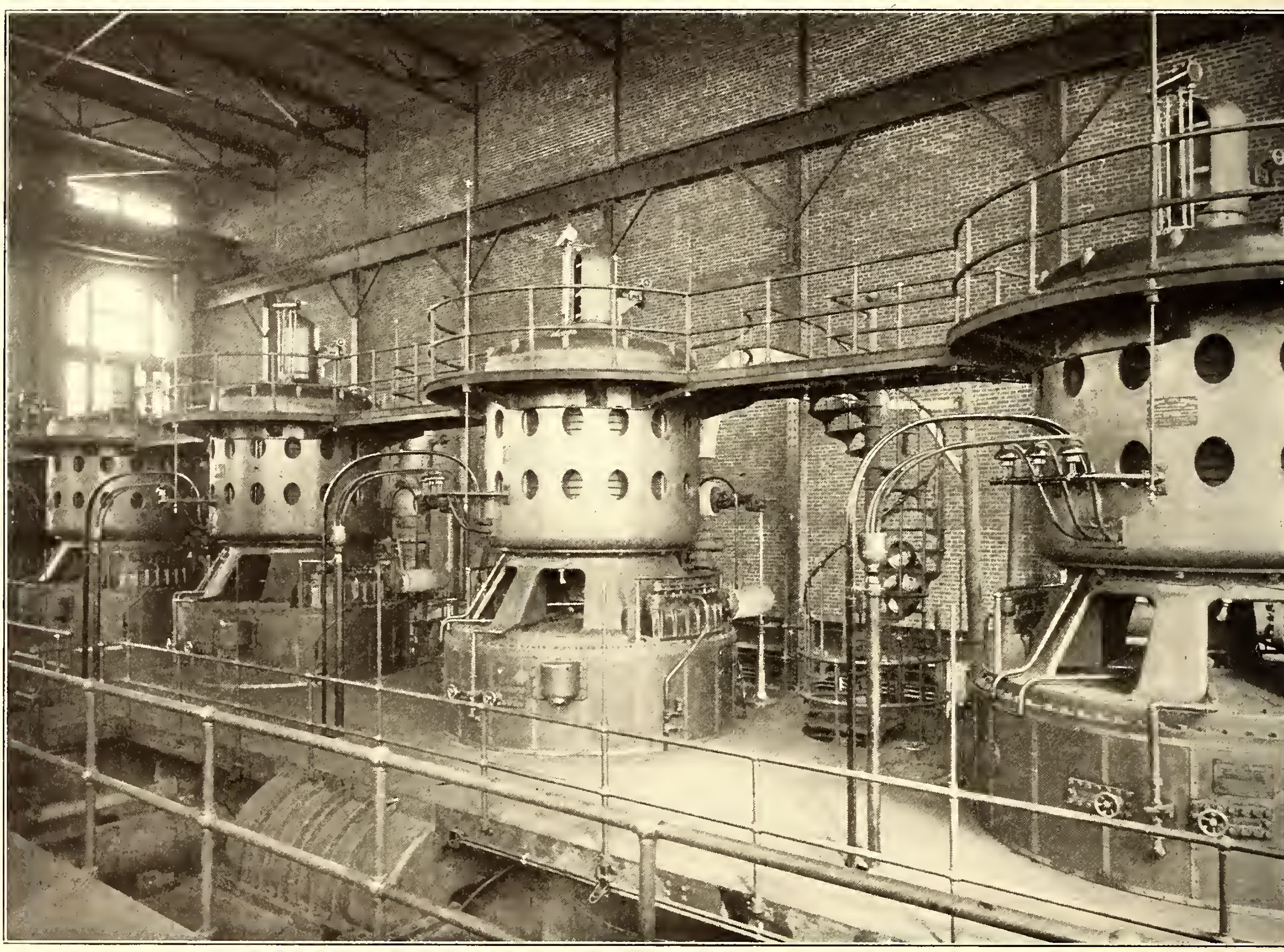
Whether we shall get the regular trackless trolley at present is an open question. We confess to natural curiosity in its performance, both technically and commercially. Its advent would form an effective test of the real objections of the public to the overhead trolley system. Personally, we have never been able to decide whether the league of chronic kickers objected to the track, the overhead structure or the mere existence of a public vehicle carrying passengers at a reasonable rate. We may now get data for a decision. If there is strenuous opposition to a trackless trolley the first-named possibility is eliminated. If no objection is raised to a public automobile line, overhead wiring is the required Jonah. We must confess, however, to a certain sneaking feeling that there are regions in which the residents would fain suppress all public vehicles charging less fare than a New York cabman. How they will enjoy the big eight-seated gasoline car with the guide bawling through a megaphone: "On the right is the villa of Boodle J. McBonds, Esq.—cost $210,000, has 170 acres of park and 6 miles of private drive—the public not admitted, but we pass close by the garden where the McBonds generally sit!" Yes, the trackless trolley in any form has great possibilities in places where they oppose track franchises. As to practical danger of competition from such like vehicles, we do not consider it serious unless, through some influence, they can obtain immunity from the speed regulations that oppress electric roads. The moment that public vehicles enjoying practically free use of the public roads are allowed to run at such speed as they may wish, the ordinary railway, with a safe and proper track and law-abiding intentions, is at a disadvantage. One can hardly discriminate between public and private vehicles of the same character, so that if the importunities of private owners are heeded, there is an open door for injustice to the many electric roads that are doing their best to serve the public. Our sole objection to the trackless trolley from the standpoint of public policy is that it may tend to encourage such discrimination. Anyhow, we hope soon to see a line in operation, for, as an engineering feat, it will be of more than usual interest.

A One-Hundred-Foot Right of Way

Every interurban railway builder of experience seems to agree on the importance of purchasing a right of way through the open country at least 100 ft. wide. The cost per mile for right of way is usually a very small item in the total cost of an interurban road, and attempts to save a little by getting a right of way less than 100 ft. wide are likely to be regretted after the road is in operation. The wide right of way is important, not only to provide ample room at deep cuts and high embankments, but to allow snow fences to be placed in winter. As to the legal and business difficulties involved, it is practically as easy to get 100 ft. as it is to get 50 ft. or 60 ft., and it is certainly very much easier and cheaper to get 100 ft. at the time the right of way is first secured than it is to get it later should the road want a wider strip.

POWER GENERATING AND DISTRIBUTING SYSTEM OF THE OLD COLONY STREET RAILWAY

Late in 1902, the Old Colony Street Railway Company found itself in possession of some 400 miles of electric railway trackage stretching in a network of lines from Boston south to Newport, R. I., and covering a strip of territory roughly 70 miles long by 30 miles wide. Some of the properties included were new, others had been in independent operation for years, but all of them had been welded into one comprehensive and more or less unified system by purchase through the medium of the Massachusetts Electric Companies, and by their transfer to the Old Colony Street Railway Company as the operating corporation.



INTERIOR QUINCY POINT GENERATING STATION, OLD COLONY STREET RAILWAY

At that time power for running all these lines was generated in eleven separate stations, scattered irregularly over the territory served. These were the original stations taken over with the acquisition of the underlying companies, and all of them contained direct-current generating apparatus, most of which was more or less antiquated. Located as these power houses were to serve the needs of the several roads when they were under independent managements, few of them were situated advantageously with respect to the load conditions on the consolidated system as a whole, and moreover, some of them were inland stations, with poor facilities for receiving coal and supplies, so that the cost of producing power on the combined property was abnormally high per unit of energy. Furthermore, there was not sufficient power to meet the new requirements.

Confronted with this situation, the Old Colony Company, soon after it took over the merged properties, set about making plans for an entire rearrangement of the power generating and distributing system. After considerable preliminary work these plans resolved down into a general scheme for abandoning all of the direct-current stations and substituting therefor two high-tension alternating-current generating central stations, one to be located at Quincy Point, a short distance south of Boston, and one at Fall River, these two stations to feed current at high voltage to converting and transforming sub-stations located for the most part at or near the sites of the old direct-current power houses. This scheme, so far as it includes the building of the Quincy Point central station and the installation of several of the sub-stations, has now been consummated, and the company is already receiving the benefits of an adequate power supply secured at more reasonable cost per unit of output.

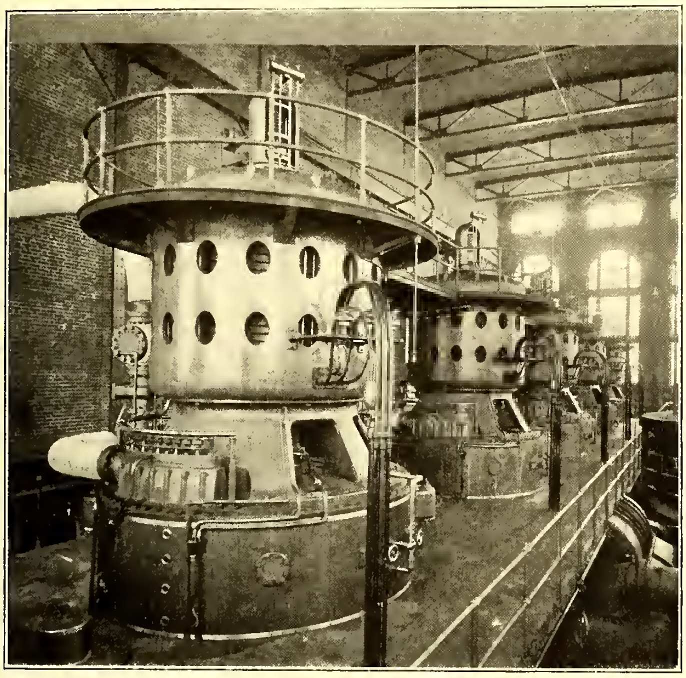
Concisely stated, the power scheme is as follows:

The main station at Quincy Point contains five Curtis vertical steam turbines, each of 2000-kw normal capacity, and each direct connected to an alternating generator delivering three-phase, 25-cycle, 13,200-volt current. This station, by the way, was the first plant of its kind in this country to use steam turbines exclusively for electric railway purposes. The current is transmitted at the initial voltage to the sub-stations, of which at the present time six have been installed. The scheme provides for three additional sub-stations, which will be installed as needed.

It can be understood readily that in dealing with a power layout of this magnitude many interesting problems have been encountered. The methods taken to solve some of these are set forth in the following description:

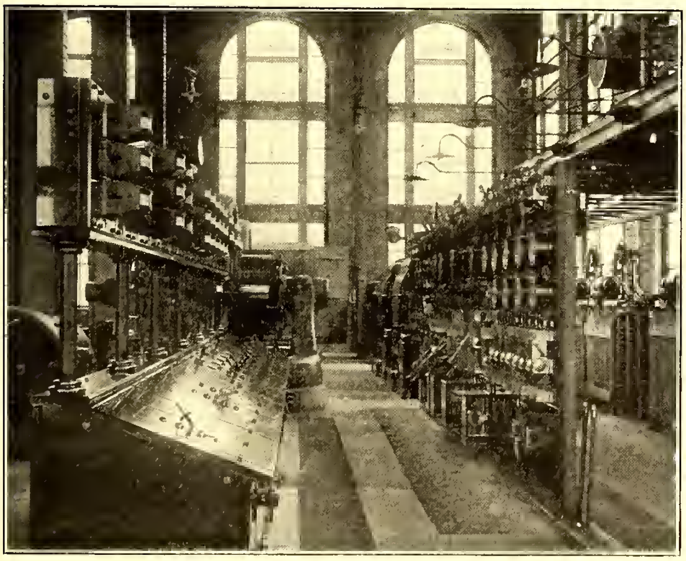
QUINCY POINT POWER HOUSE

As before stated, the main central station for the system is located at Quincy Point, about 8 miles south of Boston. The location is on tidewater, with excellent facilities for receiving fuel and with an abundance of water for condensing purposes. The building is 161 ft. wide x 121 ft. long, and is divided by a brick wall into two practically equal parts, one-half being the boiler room and the other the turbine room. In the design, provision has been made for future extensions which will require the removal of but one wall, so that the engine room and boiler room can be added to indefinitely.



TURBO-GENERATOR UNITS, QUINCY POINT STATION

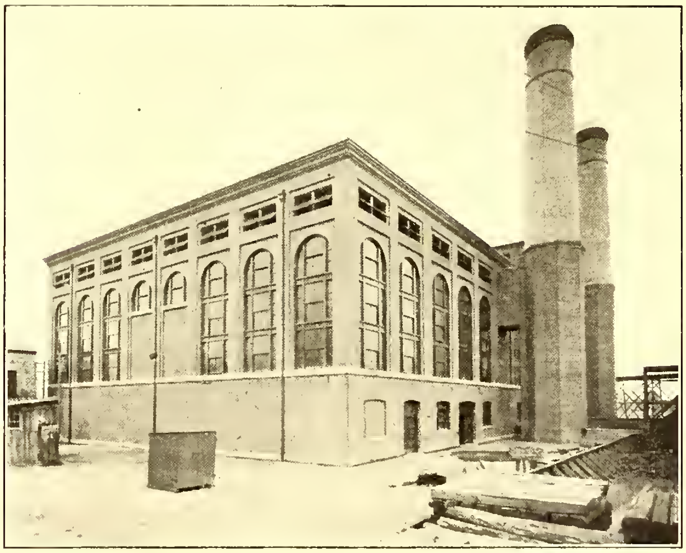
The station was built with room for five turbo-units, but when construction work was first commenced it was thought the fifth unit would not be installed for some time to come. However, during the course of construction it was decided to install the fifth unit immediately and the station is now operating with five 2000-kw Curtis vertical steam turbo-units, each adapted to run at 750 r. p. m., and each direct connected to a 25-cycle, 13,200-volt alternating-current generator. The turbines, being among the first ever built, were originally fitted with an oil step bearing. This was changed, however, during erection to the water step bearing, which is now the standard. The turbo-units extend in a single line the full length of the station, and are connected by both lower and upper galleries so that the work of the attendants is brought to the highest possible efficiency.



A. C. AND D. C. SWITCHBOARDS, QUINCY POINT GENERATING STATION

The fields of the alternators are excited by a 75-kw General Electric engine-driven exciter set, the engine being of the vertical compound type and running at 310 r. p. m. There is also a 50-kw General Electric engine-driven exciter set running at 400 r. p. m. In addition there is an auxiliary motor-driven exciter set of 50-kw capacity, driven by a 75-hp, 350-volt induction motor. Each turbine has its own condenser, which is of the "Admiralty" surface type as made by the Wheeler Condenser & Engineering Company. These condensers draw water from a concrete intake tunnel that extends under the line of turbo sets, and the water is returned to a similar discharge tunnel running parallel to the first. The intake receives salt water from the bay at one side of the building, and the discharge empties into the bay on the other side of the building. As will be noticed from the plan of the station, the turbo-units are arranged in staggered relation with respect to the intake and discharge tunnels—that is, the first unit has its condenser on the right-hand side, the second on the left, and so on alternately. This arrangement requires that the suction and discharge pipes of certain of the turbine condensers be carried under one or other of the tunnels in order to make connection with the proper one, but this slight complication is much more than counterbalanced by the saving in floor space, inasmuch as any arrangement whereby the turbine condensers would be kept all on one side of the center line would necessitate considerable lost room between each unit.

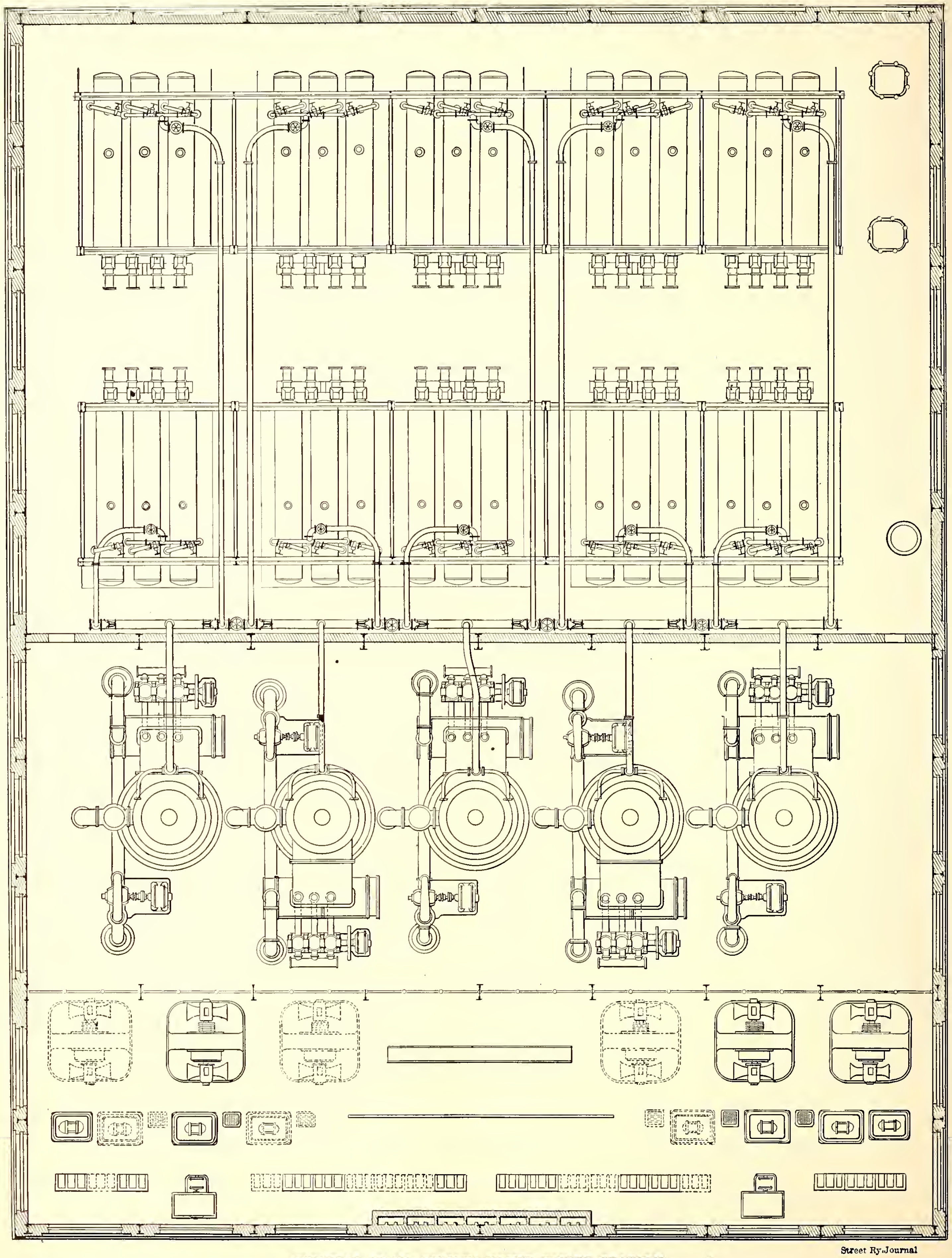
The air pumps and circulating pumps for four of the turbo-units are motor driven, but the fifth set is steam driven. In the former sets the circulating pump consists in each case of an 18-in. low-lift pump direct connected to a 100-hp General Electric motor. The air pump consists of an Edwards triplex 18-in. x 12-in. pump directly connected to a 50-hp General Electric motor. All the motors are of the induction type operating on 350 volts.



QUINCY POINT GENERATING AND SUB-STATION

On the fifth unit, where the pumps are steam driven, the circulating pump is of the 18-in. low-lift double-suction Morris type, direct connected to a 12-in. x 10-in. engine, and the air pump is of the Edwards triplex type, 18 in. x 12 ins., connected to a 10-in. x 10-in. engine.

The condensed water passes from the condensers to three tanks connected in series, each 20 ft. long x 6 ft. in diameter, located in the boiler room, and which serve the double purpose of a hot well and storage tanks. The feed-water for the boilers

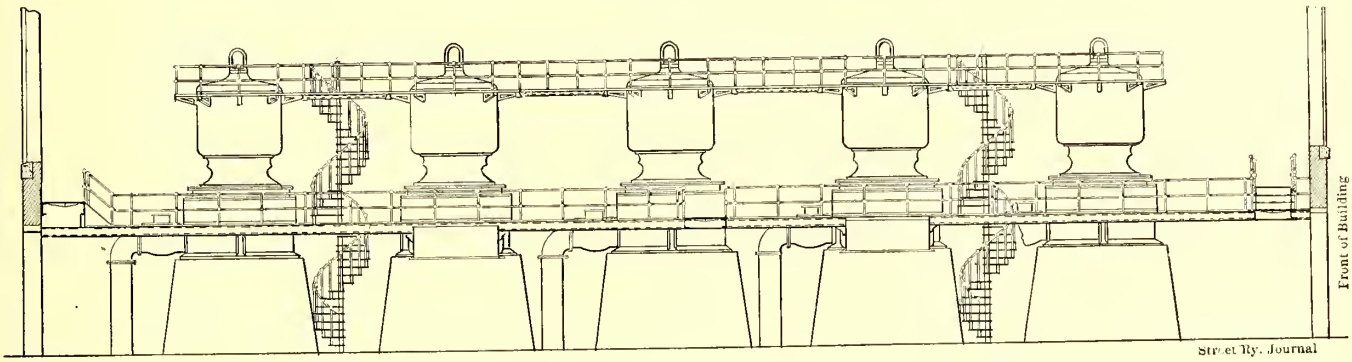


GENERAL PLAN, QUINCY POINT POWER STATION is taken from these tanks. They are also connected to the city mains, so that if the supply of feed-water falls below a predetermined amount the connections to the city mains are automatically opened, thus preventing any likelihood of shortage.

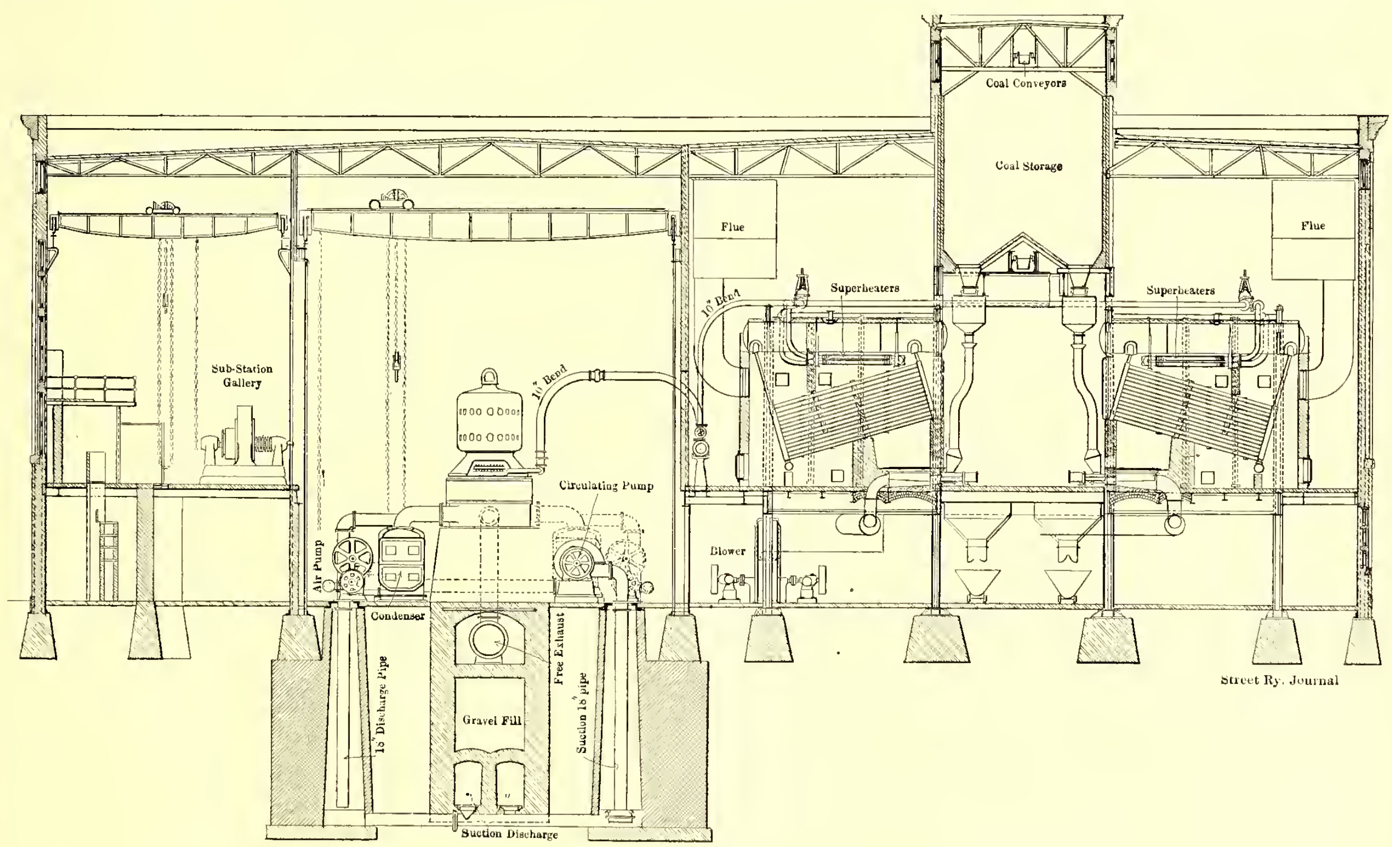
For supplying water under pressure to the step bearings of the turbines there are three steam-driven pumps. As a precaution against a possible stoppage of the supply to the step bearings, there are two "accumulators" in the turbine room. These are in fact vertical storage tanks, in which the column of water is kept under pressure by weights, and which, in the event of a stoppage of the pumps, would supply sufficient water to the bearings to run the plant for about ten minutes, or for a longer period of time than it would take to shut down the machines affected. Although it is believed this precaution is virtually not a necessity, it was decided to install the accumulators so as to make it entirely impossible for damage to occur through shortage of water in the step bearings, which would permit the shaft to drop down to the bearing surface.

The switchboard at this station is of rather unusual design. All high-tension switches and appliances are controlled electrically by low-voltage auxiliary circuits manipulated from a bench board placed in front of the low-tension upright panels, and so arranged as to permit the operator to face the main engine room when controlling the main machines.

The instrument board has the following panels in use: Five 13,200-volt generating panels; three exciter panels; three alternating rotary panels; three direct-current rotary panels; three 13,200-volt outgoing feeder panels; one direct-current booster panel; one direct-current totalizing panel; two auxiliary panels; four d. c. feeder panels, and one emergency feeder panel, some of these panels, as will be understood, being in connection with one of the sub-stations, which is located on a gallery in the main turbine room. All of the controlling switches are of the high-tension motor-operated type, placed in cells on the switchboard floor. All of the lightning arresters for the station are banked in a separate gallery over the switchboard proper.



LONGITUDINAL ELEVATION OF TURBINE PLATFORMS

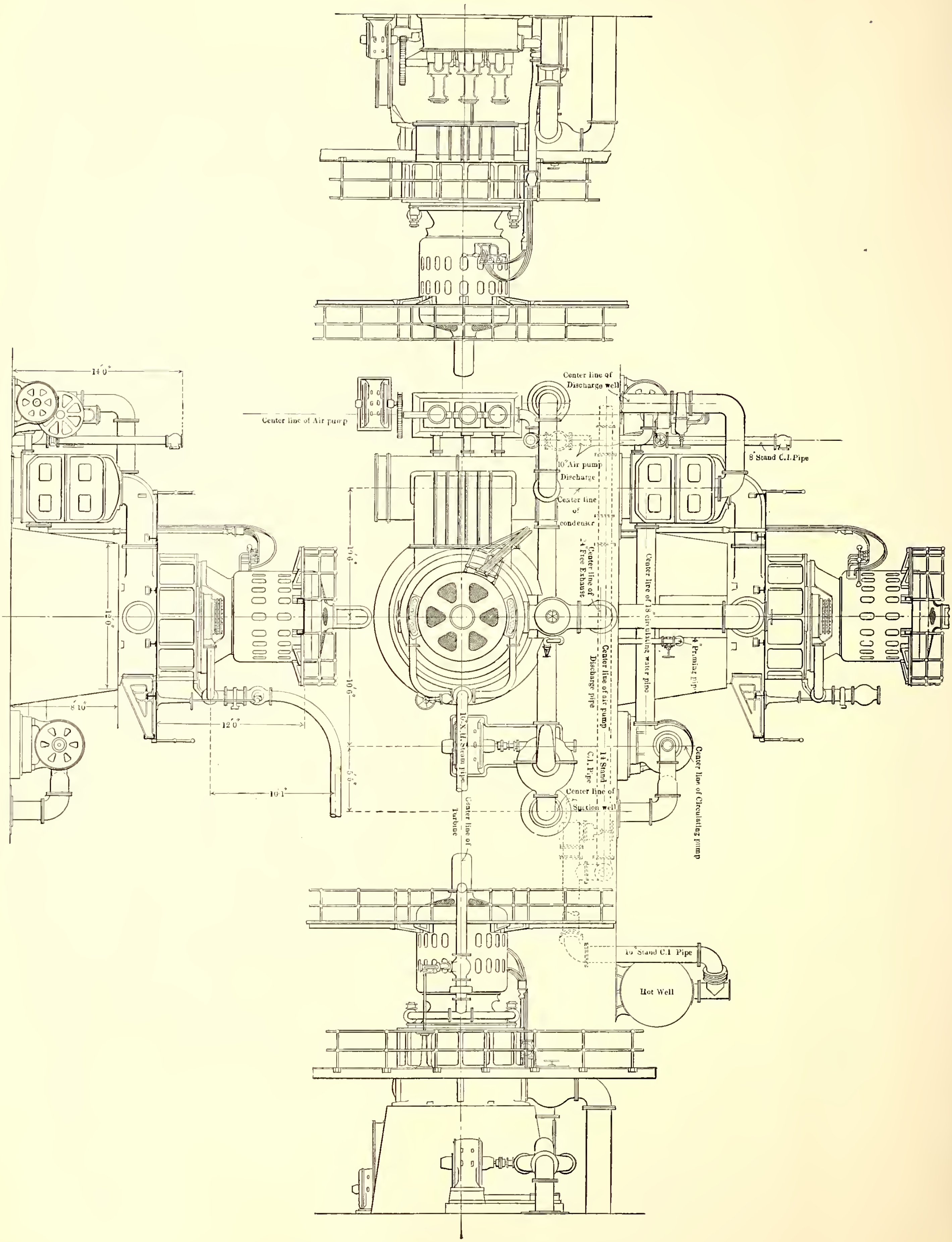


SECTIONAL ELEVATION, QUINCY POINT POWER STATION

BOILER ROOM

Steam is generated in ten 750-hp water-tube boilers, arranged in two lines facing each other, with a wide aisle between. Eight of the boilers were furnished by Aultman & Taylor and two by Babcock & Wilcox.

The boiler room floor is 14 ft. above grade, this arrangement giving a sub-cellar, which is utilized in part for ash tracks, the



SINGLE TURBINE UNIT

ashes being allowed to drop from in front of the boilers directly into carts which run over a narrow gage track, and the shes are used for filling in the property around the power station.

The arrangement is such that each pair of opposite boilers constitutes a boiler unit. Each battery is provided with an engine-driven blower for forced draft. The blower system was furnished by B. F. Sturtevant Company. The eight Aultman & Taylor boilers are equipped with Jones under-feed stokers. Under normal conditions the turbines are operated with superheated steam, all of the boilers being fitted with internal superheaters, the Aultman & Taylor batteries having Foster superheaters and the Babcock & Wilcox having superheaters of the Babcock & Wilcox type. The arrangement is such that the degree of superheat in each unit can be regulated to a nicety, and the station can be operated, if desired, with part of the boilers giving superheated steam and part saturated. By means of the unusually flexible layout of feed and steam piping, comparative tests can be made at any time with any portion of the boiler room equipment delivering superheat and any other portion giving saturated steam.

The feed-water is normally taken from the hot-water storage tanks which receive the condensed water from the condensers. It is then pumped by steam-driven Snow pumps to the heaters, which are of the National type. All the feed-water piping over 3 ins. in diameter is cast iron, and less than this size is brass.

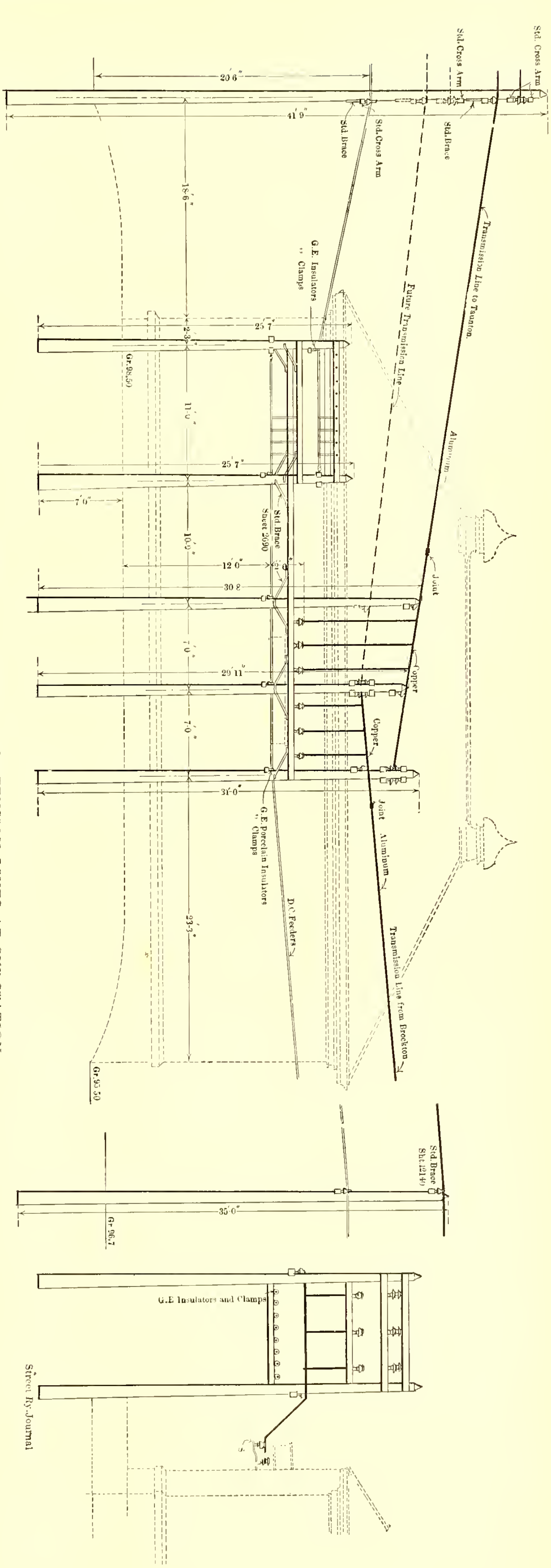
The main 12-in. steam header is carried on roller pedestals just above the boiler-room floor and extends along the partition wall that separates the boiler room from the turbine room. The steam passes from each battery of boilers through 10-in. bends and connections, and is carried from the header to each turbine by a straight-away 10-in. bend, as indicated on the drawing. In designing the piping, the aim has been to secure a high degree of flexibility so that any set of boilers or combination of boilers can serve any one of the turbo-units.

At the present time, coal for this station is delivered from vessels at a wharf alongside the power house. Coal is unloaded by shears, and is delivered to the crusher hoppers of the coal-conveying apparatus, which are located in a concrete tunnel that extends from the wharf to a point under the boiler room. The line of bucket conveyors travels through this tunnel and then rises to the coal-storage bins above the boilers, from which the coal is fed to the stokers through chutes. The entire coal crushing and handling apparatus is of the McCaslin type, manufactured and installed by J. A. Mead & Company. The coal conveyor is actuated by variable-speed a. c. motors working on 350 volts. Eventually an elevated coal-storage bunker will be erected near the water edge, and the shears will be supplanted with a modern coal-elevating system for unloading vessels.

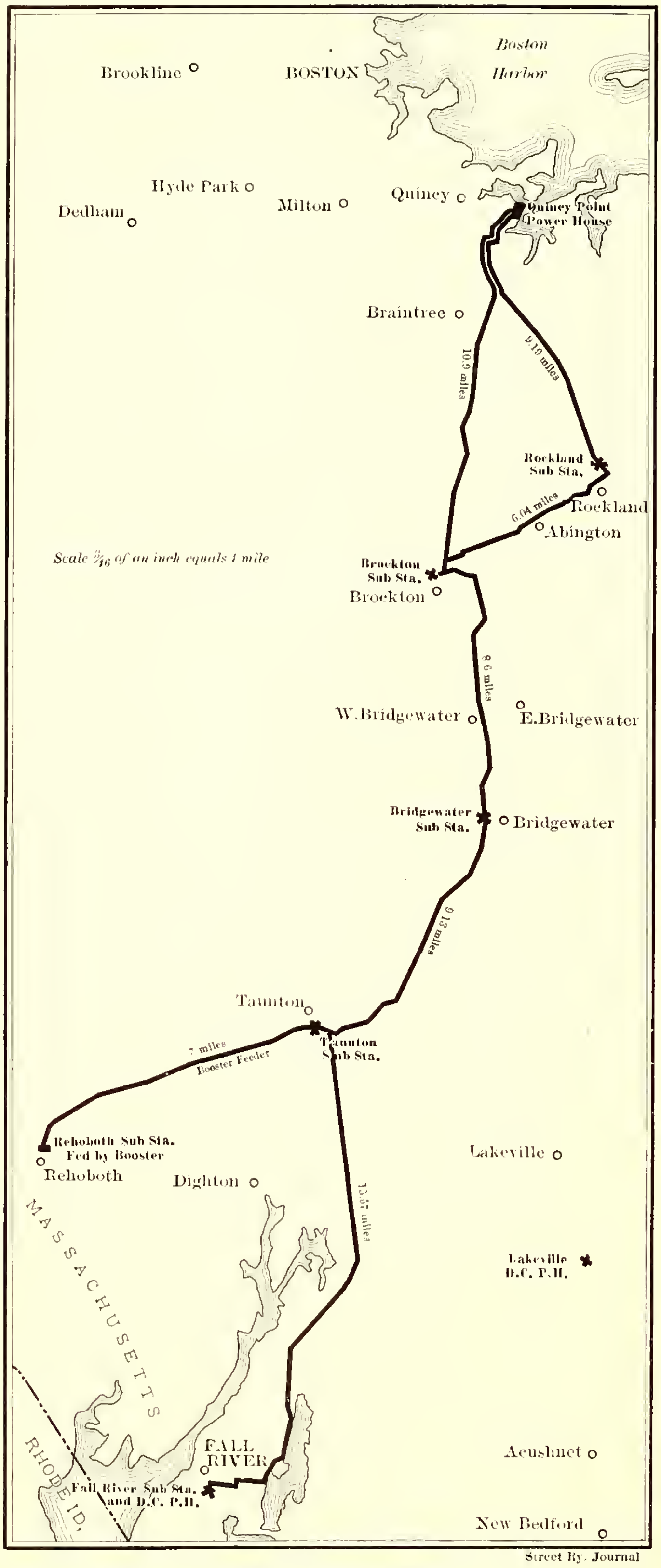
SUB-STATIONS

The broad scheme for power layout calls for nine substations distributed over the territory, so that each substation will serve an area of about 5 miles in each direction. These stations will be located respectively at the following points: Quincy Point, Brockton, Milton, Rockland, Bridgewater, Taunton, Fall River, Lakeville, and Portsmouth, R. I. At the present writing six of these stations have been installed, the location and equipment of each being as follows:

Quincy Point.—The transforming and converting apparatus at this point is located along one side of the turbine room in the main generating station. Here are installed three 750-kw, 25-cycle, 600-volt, d. c., compound-



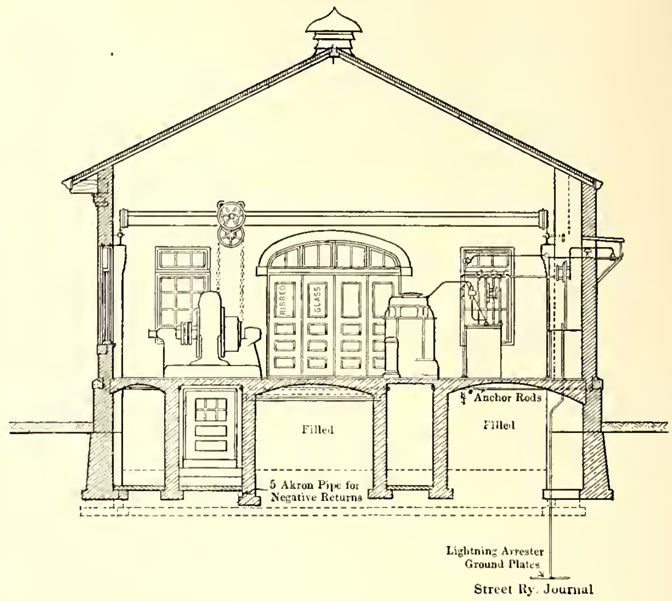
TERMINAL POLES ON HIGH-TENSION LINES AT SUB-STATION wound rotary converters, and three 825-kw air-blast type transformers. There are also two 330-kw auxiliary transformers for delivering alternating current at 350 volts to the various induction motors used for driving the exciter sets, blower sets, condenser pumps, coal-handling machinery, etc.



LAYOUT OF HIGH-TENSION TRANSMISSION LINES, OLD COLONY SYSTEM

Brockton.—Three 750-kw converters and three 825-kw air-blast transformers are located at this sub-station. The switchboard consists of three alternating rotary converter panels, three direct-current rotary converter panels, two incoming high-tension panels, one outgoing high-tension panel, one totalizing d. c. panel and seven d. c. feeder panels.

Rockland.—The apparatus at Rockland consists of three 300-kw rotary converters and three 330-kw air-blast transformers. The switchboard comprises three alternating rotary converter panels, three d. c. rotary converter panels, one a. c. incoming

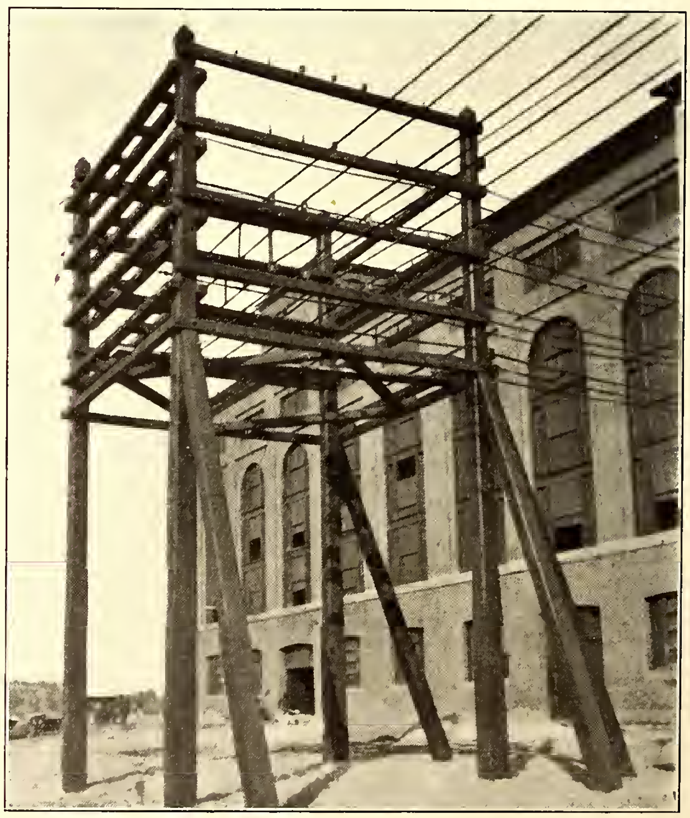


TRANSVERSE SECTION, BRIDGEWATER SUB-STATION

line panel, one a. c. outgoing line panel, one d. c. totalizing panel and four d. c. feeder panels.

Bridgewater.—The apparatus at this station is a duplicate of that at Rockland.

Taunton.—At this station there are three 500-kw rotaries

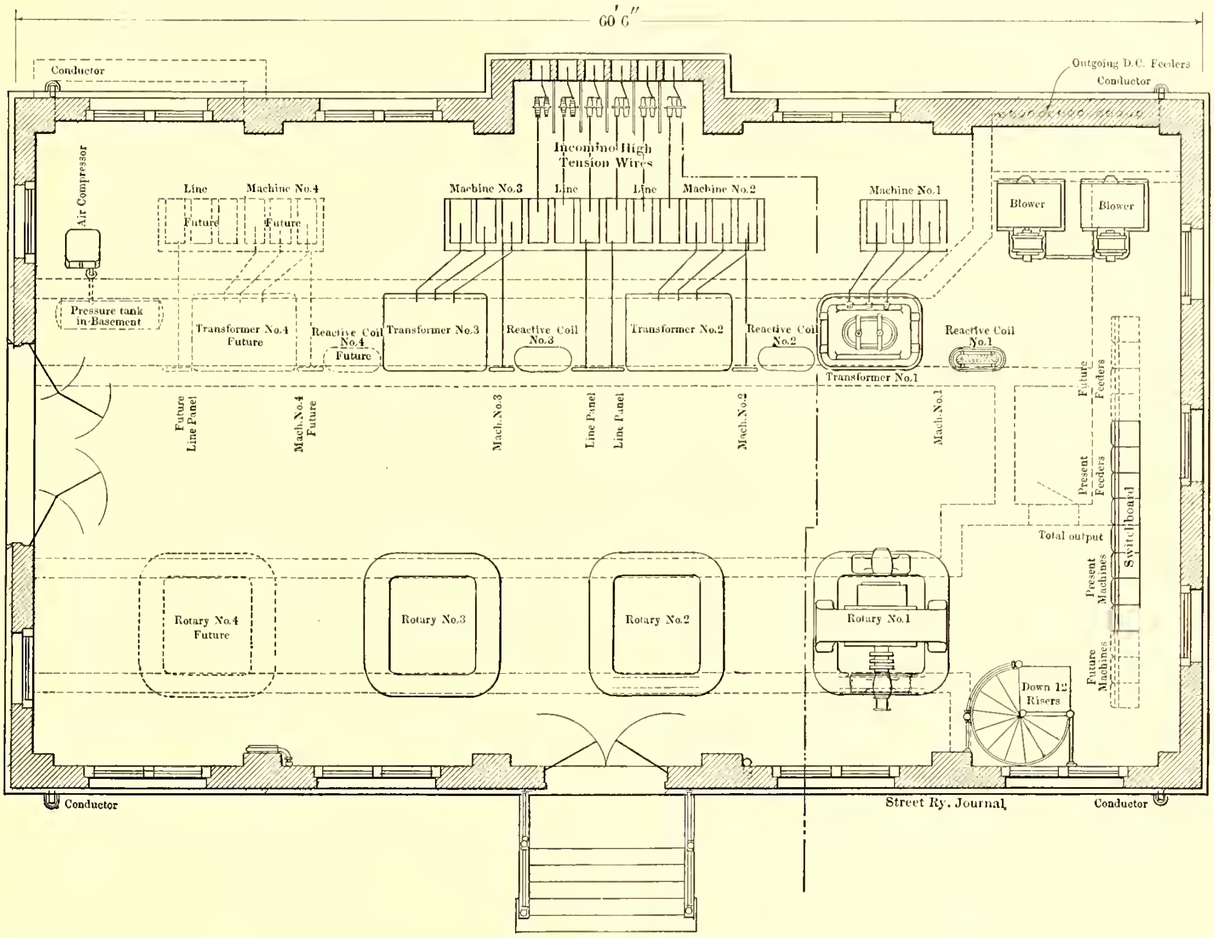


ANCHORAGE POLES, QUINCY POINT STATION

and one 750-kw rotary, three 550-kw air-blast transformers and one 825-kw transformer. The switchboard consists of four alternating rotary converter panels, four d. c. rotary converter panels, one a. c. incoming line panel, one a. c. outgoing line panel, one d. c. totalizing panel and seven d. c. feeder panels. There is also at this station a 200-kw booster set operated by a

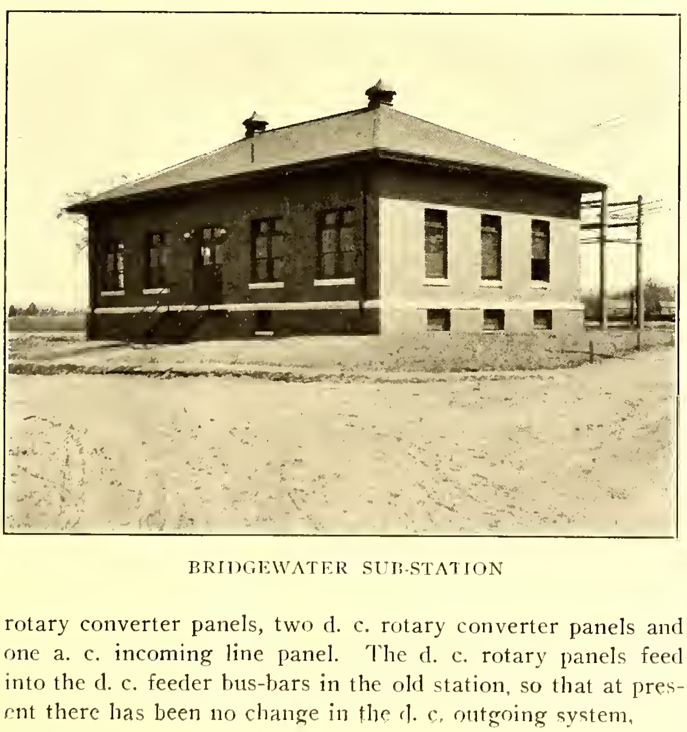
600-volt d. c. motor, the booster being used to furnish direct current to the Providence & Taunton line.

Fall River.—At this station the old direct-current apparatus has been retained and two 750-kw rotaries have been installed



GENERAL PLAN, BRIDGEWATER SUB-STATION

to help out on the lines in this locality. They receive alternating current from the Quincy Point plant. The sub-station apparatus consists of two 750-kw rotaries and two 825-kw air-blast transformers. The switchboard consists of two a. c.

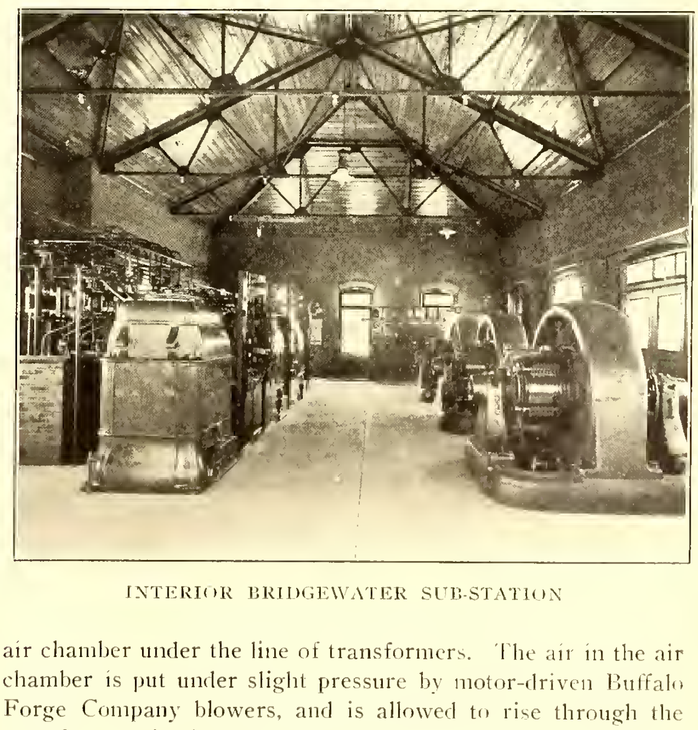


BRIDGEWATER SUB-STATION

rotary converter panels, two d. c. rotary converter panels and one a. c. incoming line panel. The d. c. rotary panels feed into the d. c. feeder bus-bars in the old station, so that at present there has been no change in the d. c. outgoing system.

In general design all the sub-stations are similar, and all the apparatus is of the General Electric Company's latest type for this class of service. The transformers are somewhat unusual, in that there is but one transformer for each converter—that is, the separate transformer for each phase has been avoided and the three transformers commonly used in this work have been combined in a single piece of apparatus.

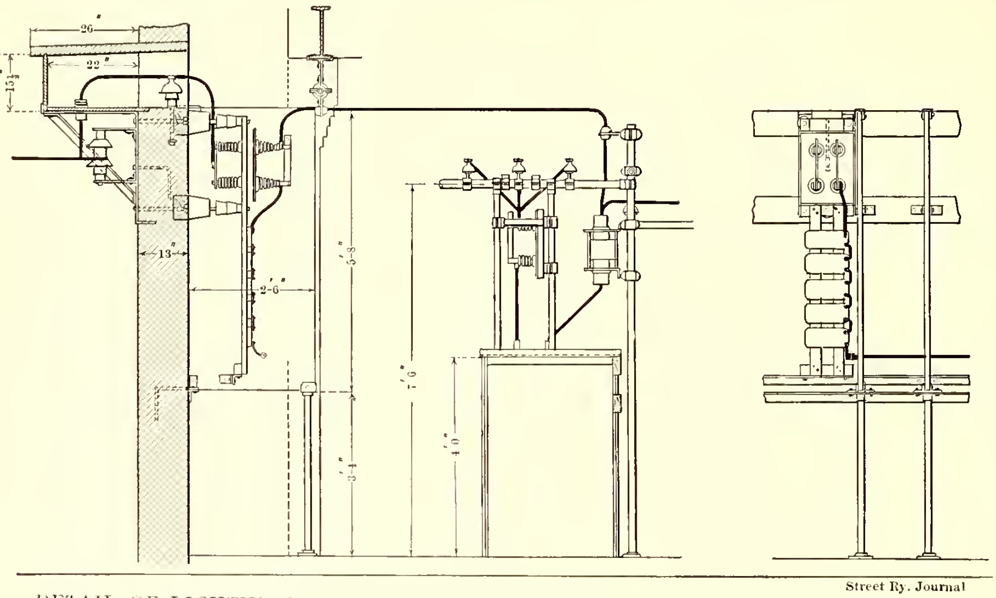
Following the common practice, there is at each station an



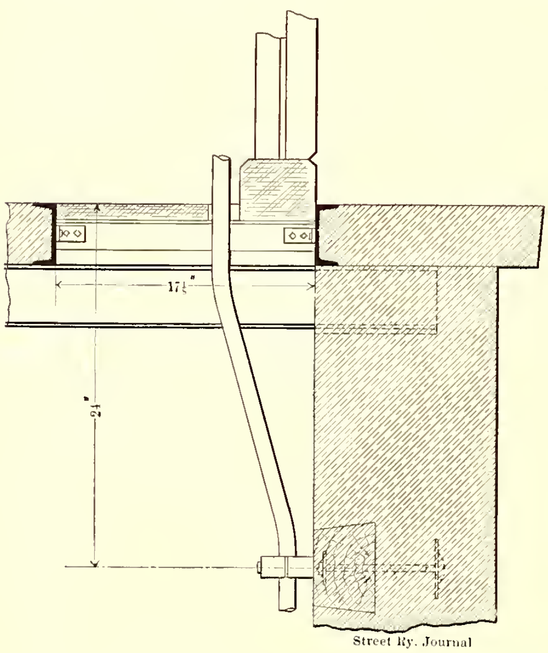
INTERIOR BRIDGEWATER SUB-STATION

air chamber under the line of transformers. The air in the air chamber is put under slight pressure by motor-driven Buffalo Forge Company blowers, and is allowed to rise through the transformers in the usual way, for cooling purposes. At several of the stations an air-compressing outfit is provided for furnishing compressed air used in cleaning out electrical apparatus and switchboard. The air compressor is motor driven in each case.

In general, the sub-stations are plain brick buildings with pitched slate roofs supported on light steel truss girders. Copper canopy ventilators are placed in the peak of the roof to insure good ventilation within the building, and the high-tension wires just before entering the sub-station are brought to special pole anchorages, the details of which are set forth in the drawings. There is nothing remarkable in the general layout of the anchorages, but it presents an excellent example of a good, plain job, combining simplicity with safety, strength and durability.



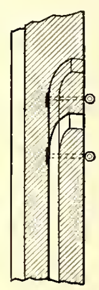
DETAIL OF LIGHTNING ARRESTERS AND HIGH-TENSION WIRING, BRIDGEWATER SUB-STATION

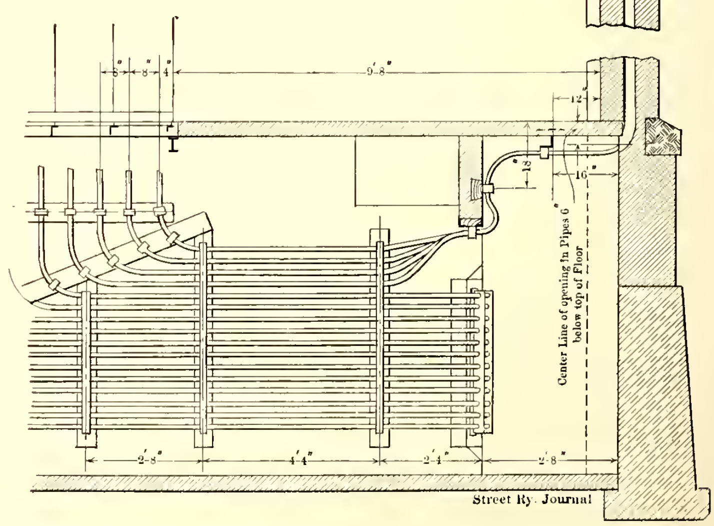


METHOD OF TAKING D. C. CABLES THROUGH FLOORS AT SUB-STATIONS

From the pole anchorage the wires pass on a slight downward angle directly to the building anchorage on the outside wall of the station. The details of this arrangement are interesting. In the first place the entrance anchorage and openings are protected from the weather by a box or hood carried on wrought-iron brackets projecting about 2 ft. from the wall and held in place by wrought-iron angle-iron straps in the manner indicated. Each wire from the pole is attached first to a heavy porcelain strain insulator carried on a bracket from the side wall just under the shelf before mentioned. This insulator, of course, forms the main anchorage, and takes whatever outward stress there may be. From this the wire passes immediately to a second strain insulator upon which it is anchored. From a point between the two insulators the tap rises, passes into the box through a wall insulator in the shelf, turns and enters the building through an opening in the wall, which, as before stated, is protected by the box. Within the wall the wires pass over petticoat insulators and then turn down to the lightning arresters, all of which are mounted on the inside wall just below the point at which the wires enter. The arresters are carried on insulators mounted on wooden blocks let into the side wall.

In the sub-station design an effort has been made to reduce the high-tension wiring within the stations, and the runs of high-tension cables have been made as short as possible. Wherever it could be arranged, wires are brought into the station at one side, where they pass by a short run to the transformers, then through tile conduits across the station to the rotaries, then to the d. c. switchboard and out at the other side of the station so as to avoid, wherever possible, the crossing of high-tension and direct-current cables. The direct-current feeders within the building, and where they pass through the walls, are carried in concealed wrought-iron pipes. Modifications of this arrangement were, of course, necessary at certain points, but the typical arrangement will be understood from the accompanying drawings illustrating the Bridgewater sub-station.



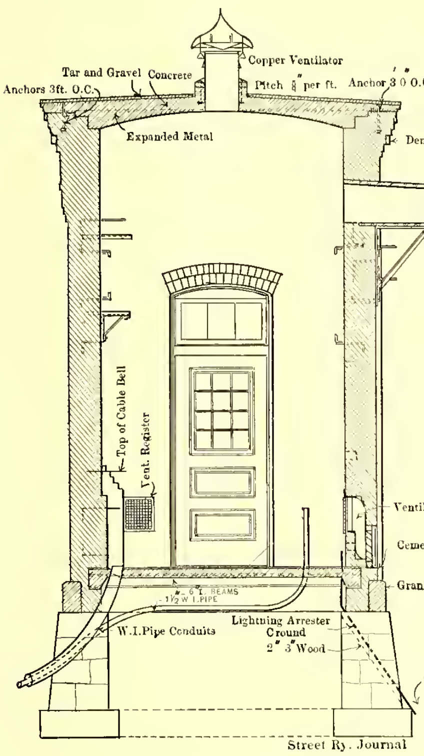


METHOD OF CARRYING D. C. CABLES IN SUB-STATIONS

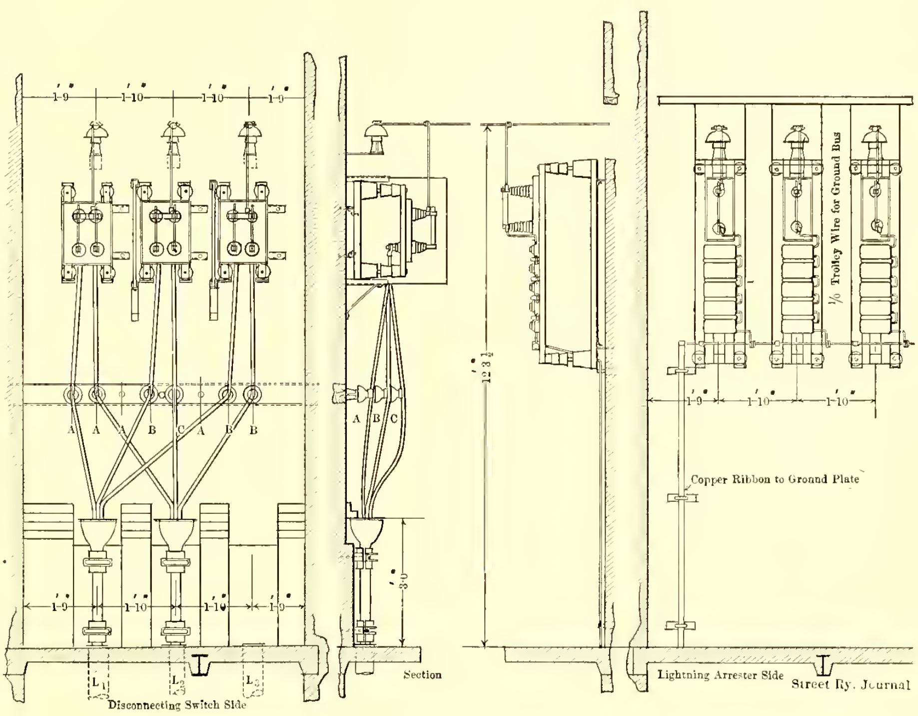
TRANSMISSION LINE

There are two 13,200-volt transmission lines running out of Quincy Point. One of these extends south to Fall River, and serves the sub-stations at Brockton, Bridgewater, Taunton and Fall River. The second line serves the sub-station at Rockland,

and is then tied in with the station in Brockton. The transmission wires are strengthened aluminum cables, equivalent to 262,000-circ. mil capacity. On straight lines the wires are carried on 35-ft. poles, and the three phases are carried flat on the pole tops, except where there are two circuits on the same pole line, in which case the circuits are connected in double delta. The entire pole line is installed with Locke porcelain insulators. The cross-arms are 4-in. x 6-in. hard pine, and are attached to the poles by two ⅝-in. bolts which pass through the arm and the pole, the opposite side of the pole being counter bored to receive the bolt heads. The arms are braced by 2-in. x 2-in. x ¼-in. angle-iron braces, fastened to the pole by two ½-in. x 4-in. lag screws, and to the under side of the arms by double ½-in. bolts. On angle construction heavier poles are put in, and the angle poles have double cross-arms thoroughly braced.



TERMINAL HOUSE



WIRING, FALL RIVER TERMINAL HOUSE

Inasmuch as it was necessary to run the transmission lines through several municipalities, it was thought best to carry the high-tension cables underground through thickly populated districts. At each point where the line enters or leaves the underground conduits there has been erected a terminal house in which are located disconnecting switches, lightning arresters, etc. The design of these houses will be understood from the drawings of the Fall River house, which is typical of the others. The house consists of a brick building 15 ft. x 11 ft. and 16 ft. high, resting on stone foundations. There is no combustible material used in the construction. The floor consists of 4 ins. of concrete, reinforced by 6-in. I-beams and sheets of expanded metal. The roof is also of cement concrete, strengthened with expanded metal and covered with a top coating of tar and gravel roofing. Special provision is made for ventilating the interior. Air is drawn in through specially designed inlet registers near the floor level and passes out through a copper canopy ventilator in the roof.

Underground the high-tension current is carried on a three-conductor lead-covered cable in vitrified conduits. At the terminal house the cable leaves the conduit and is brought up through the floor of the house in wrought-iron pipe conduits to the cable bell which is located close to the inside wall about 3 ft. above the floor. From the bell the cable fans into the individual phase conductors and the three wires for each circuit are then continued straight up the inside walls to the disconnecting switches located on the wall near the roof. From the switches the wires rise and are carried across to the opposite wall, where the taps are taken off, to the lightning arresters located on this wall, as will be understood from the drawings. The main wires pass straight out through the wall at a point just under the roof, and then pass to the pole lines through the medium of special strain-insulator anchorages similar to those which have been described in connection with the sub-station designs. Within the terminal house there are two wires for each phase from multiple cables, connected in parallel by copper strips across the switches. This is done to give double the carrying capacity in the cables, in order to avoid interruption in the event of the failure of one of the cables.

A LIBERAL PASS IDEA

The courtesy of permitting visitors to inspect power stations is almost universal upon American electric railways, but beyond the usual cautionary stipulations the reverse sides of passes seldom bear any significance. An interesting exception occurs in the passes in force in Baltimore, which state that "any suggestions or advice as to the care, management or operation of this plant are earnestly requested." Here the company recognizes that many unusual features of operation are often apparent to strangers, which would pass unnoticed by the regular staff, and in its willingness to receive suggestions for betterment, the company exhibits a liberality that deserves favorable comment.

On May 29 the Syracuse Terminal Association opened for business its large new freight depot in West Fayette Street, Syracuse, N. Y. At present it is used for the accommodation of the freight and express business of the Auburn & Syracuse Railway only, but the Syracuse Rapid Transit Company may use it also soon. The Rochester, Syracuse & Eastern Railroad when completed to Syracuse will likewise use it. Provision has been made for future enlargement.

MAY MEETING OF THE OHIO INTERURBAN RAILWAY ASSOCIATION

The May meeting of the Ohio Interurban Railway Association, held at Cleveland, May 25, was one of the most interesting and best attended ever held by the association, about twenty-five roads being represented. The most important action was the adoption by the association of the following resolution:

Whereas, A demand for improved service on interurban roads has very largely increased the operating expenses of such roads, and many roads have met this demand; and, Whereas, in order to obtain their share of the business many other roads contemplate improving their service in like manner; and, Whereas, the prevailing low rate of fare on most interurban roads will not permit of such improvement in service, therefore, be it resolved, that the Ohio Interurban Railway Association recommend a uniform base rate of 2 cents per mile, and a minimum charge of 10 cents.

In introducing the subject, President Spring said that the majority of Ohio roads were now charging in the neighborhood of 2 cents per mile, but as indicated in the tables in the Street Railway Journal of May 6, there is still quite a range of rates in this district. In view of the growing amount of through business and the widespread sale of the interchangeable coupon book, he thought it time to bring matters to a focus. He announced that three of the roads out of Dayton and two of the Columbus lines, which heretofore had given lower rates, had announced new schedules effective June 1, which brings the average up considerably, leaving only a very few roads in the State below 1.8 cents. He urged all roads in the State to take action on the recommendation.

D. H. Lavenburg, formerly with the Northern Texas Traction Company, said that the rates of this line were higher than those of the parallel steam line. Originally the steam road charged $1.80 for round trip from Dallas to Fort Worth. The electric made a rate of $1.25. After six months the steam road reduced its rates to below that of the electric and put on a mileage book, giving 1 cent per mile. The electric holds to 2 cents per mile, and an agent of the steam road told him that the electric enjoys 80 per cent of the local business between these points, due to the frequent and convenient service.

H. C. Lang, of the Western Ohio, said that that company had a 2-cent basis, with 10 per cent reduction from twice the single fare for round trip. Ten months ago they put on limited cars, at which time the parallel steam road met their rates. It has been ascertained from reliable sources that the steam road has an average of less than five passengers per day for each competing point, despite frequent service and equal rates. The Aurora, Elgin & Chicago has four competing roads, giving an average of three trains to every electric car operated, but, as is well known, the interurban road is doing a splendid business. The steam roads sell twenty-five-ride books at 1¼ cents per mile and commutation books as low at 4-10 cent per mile. Recently the interurban secured entrance into Chicago and raised the rates 10 per cent to cover the amount paid to the city company, and an additional 10 per cent on local tickets. For a time it was feared this was a mistake, but at present the business shows an increase of 300 per cent, and many people are not yet acquainted with the fact that cars are operating to the heart of the city.

Other managers related experiences with increasing of rates, and it was the general opinion that with a 2-cent rate the interurbans can hold the business.

The plan of doing away with 5-cent fares and making a minimum fare of 10 cents, except in municipalities, was looked upon with considerable favor. Several of the Dayton roads have adopted this policy and others are considering it. It is claimed that the modern heavy interurban cars consume so much power in accelerating and are so expensive to maintain that it is not profitable to stop and start a car and carry a passenger a short distance for 5 cents.

J. W. Brown, of the Pittsburg, McKeesport & Connellsville Railway, introduced the subject, "Is it advisable to charge a greater rate of fare on trains than for ticket fares?" Quoting from the Street Railway Journal of May 6, he showed that the majority of Ohio roads sold tickets, but only a small per cent made a difference between cash and ticket fares. Michigan and Indiana roads do not make a difference in any case. He believed in encouraging people to buy tickets, as it meant cash on the counter instead of in the conductors' pockets. He said that the majority of those roads that favored the plan charged the regular established rate on the car and made the discount to the passenger who bought the ticket. He thought the ticket rate ought to be the established rate, with an excess where the passenger did not buy a ticket.

Mr. Surbeck, of the Lake Shore Electric, said that that company made it an object to buy a ticket, as a reduction was made on all fares over 20 cents. The cash fare from Cleveland to Toledo is $2.05, but the company sells a ticket between the two points for $1.75. He believed in keeping the money in the ticket offices as far as possible, and thought it would be better if there were no cash fares. About 66 per cent of receipts are in tickets. The annoyance to country people is not as great as might be expected. The company sells tickets at offices for the intermediate 5 cents' points so that single and round-trip tickets can be bought for all stopping points. Tickets insure better train service, as a conductor has more time to look after passengers. Fifty tickets can be collected in the same time it takes to punch fifteen duplexes. Conductors frequently lose money from their pockets in running to derailers, but never tickets.

C. M. Wilcoxon, of the Cleveland & Southwestern, admitted that tickets simplified the collection of fares and had many other advantages, but he doubted the wisdom of charging more on cars than for tickets unless all patrons could be offered facilities for buying reduced rate tickets. The country people and passengers who desire to board cars at street crossings without going to the center of a city make up a large per cent of the total business, and it would not do to penalize such people. He thought such a plan defeated one of the chief advantages claimed by interurban roads.

J. A. Jordan, of the Cleveland, Painesville & Eastern, did not think it advisable. His company makes a discount on round-trip tickets which are sold only at ticket offices.

H. C. Lang, of the Western Ohio, thought there might be considerable advantage in making the cash-fare receipt redeemable for the difference when presented at a ticket office. The fact that the receipt had value would cause a passenger to examine it and would render it impossible for conductors to manipulate receipts. There would be a percentage of profit in receipts not redeemed.

F. D. Carpenter, of the Western Ohio, mentioned several steam roads that had tried the plan outlined by Mr. Lang and had abandoned it. He thought that where tickets were sold at every station and a reduction made that country people would make it a point to secure them. On its park business at Lima the company makes a reduction where tickets are bought, and in consequence collects very little cash, although many people get on along the line. People frequently buy several tickets at a time.

C. O. Scranton, of the Stark Electric Railway, said that the cash fare on that road was based on 2 cents per mile, and a reduction of 5 cents was made on tickets costing over 20 cents. To accommodate country people, conductors sell twenty 5-cent tickets for $1, and these tickets are accepted at the ticket rate of fare. The conductors pay for these tickets in advance. He admitted this plan gave a considerable discount on the smaller fares.

Theodore Stebbins, of the Appleyard roads, said they had tried charging more for cash fares than for tickets, but had given it up on account of the complaints of country people. He was inclined to question the advisability of selling tickets at all, on account of the chances of collusion between ticket agents and conductors—that is, conductors failing to punch tickets and agents selling them over again. His roads are using a new cash receipt in which the duplicate stub is concealed in a holder, making it impossible for a conductor to figure his collections. He inquired as to the advisability of limiting the return coupons of round-trip tickets to thirty days and found that it was general practice. Several doubted the legality unless a reduced rate was given. One manager said he had lost in a case where he had been sued for ejecting a passenger who had an expired one-day round-trip ticket.

H. A. Nicholl, of the Indiana Union Traction Company, said that that company sold no tickets except on cars, and that it gave a 10 per cent reduction from double the one-way fare on round-trip tickets. The company is now considering establishing ticket offices.

A resolution to make the fare paid on a car greater than the ticket fare to the same point was proposed, but was defeated by a tie vote.

The engineering subjects discussed were "The Advantages and the Disadvantages of the Use of Stub Switches on Single-Track Roads at All Points Other Than Regular Meeting Points," "Advantages and Disadvantages of Spring Switches," and "Oil or Electric Lights for Sidings."

C. M. Wilcoxon, of the Cleveland & Southwestern, thought there was a marked advantage in the use of stub sidings at points other than regular meeting points. He questioned if they were not advisable at all points except on roads of unusually high speed. The cost and maintenance are reduced, there is less danger of derailments and less chance of switches being left open.

F. D. Carpenter, of the Western Ohio, said that the majority of that company's stub switches are in the country, while sidings with double ends are near stations in nearly all cases where stops are made. The stub switches have locked points and spring switches are used at double-end sidings. A few derailments have occurred, due to weak springs or expanding joints, but there have been no serious accidents. Motormen are required to go over spring switches with the car under control.

Theodore Stebbins, of the Appleyard lines, said they had spring switches at regular passing points. The companies are very vigilant about inspections and never had an accident. The sidings are very long.

D. H. Lavenburg, of the Toledo & Indiana, said that that company had spring switches at all regular points. The switches are closed at one end and open at the other. If both cars are on time, neither stops, but there is a strict order that where one car is late the opposing car must not start until the other has crossed the frog. He thought stub switches a disadvantage, as it was frequently necessary to change passing points, causing delays if the sidings were not all alike. He had never had a derailment. At one time he was on a car where the air gave out approaching the siding and the car went around the siding safely at 45 m.p.h.

F. W. Coen, of the Lake Shore Electric, favored spring switches. He could recall only one slight accident in six years, whereas his company had had two or three accidents due to lock switches being left open. The Indianapolis & Northwestern was referred to as a high-speed road using lock switches exclusively.

E. P. Roberts, of the Roberts & Abbott Company, engineers, said that the majority of managers preferred the spring switch. He thought it an advantage to have long sidings, so that cars could keep in motion. It also rendered it possible for a car to stop in time should an opposing car take the siding or split the switch.

W. B. Tarkington, of the Detroit, Monroe & Toledo, said that with No. 12 frogs they leave the points open, and with No. 9 or smaller, the point is closed. The sidings are all a mile long, and spring switches are used. They are inspected frequently and extra precautions are taken in winter.

J. W. Brown, of the Pittsburg, McKeesport & Connellsville, thought more accidents occurred with stub switches than with open-end switches. In one case a motorman backed over the end before the other car had cleared, and in another case the overhead work had been torn down, due to failure to reverse trolley in backing out, a rule which they insist upon.

H. C. Lang, of the Western Ohio, urged lengthening the schedules, if necessary, to secure perfect safety in operation. He spoke of a north and south road where stub switches are used. The southbound car always takes the siding and collisions are practically impossible. The southbound car must back up and throw the switch before it can proceed. If short through sidings are used, the car on the siding should not be permitted to start until the other car had passed.

On the subject of switch lights, W. B. Tarkington said that the Detroit, Monroe & Toledo formerly used oil lights, but had abandoned them. Steam roads are also doing away with them, and he had made a contract to furnish current for switch lamps for a parallel steam road. Formerly the company used five lights, two in each target and one in the telephone booth. Now uses six in series, placing two in the booth. The late freight crew turns them all out, and they are turned on by different crews after a certain hour. Formerly the company had the lamp switch in the booth. Now it places the switch on a pole and uses a strong handle so that it may be thrown on the fly. When lights are out, it is regarded as a danger signal. The company uses the Adams & Westlake target, with green and red lenses.

Theodore Stebbins said that the Appleyard roads had adopted the plan of allowing lamps to burn all the time. He thought the current used in burning lamps all day was more than compensated for by the power consumed in stopping and starting cars and the time lost. He estimated that from $700 to $1,000 a year would be saved by this plan. His companies formerly used five lamps in series at each siding, but now employed two 300-volt, 16-cp lamps at each target. They use 120 watts as against 300 watts for lamps five in series, and there is a saving of 50 per cent in lamp renewals. To obviate troubles from lightning they are experimenting with reactive coils. Wherever possible, they place lightning arresters at switches, as they can be taken care of easier and are a protection to lamps and cars.

H. C. Lang reported success with using three 225-volt lamps at sidings. The strength is reduced somewhat, but the life is increased.

W. H. Abbott, of the Roberts & Abbott Company, suggested dispensing with the use of lights at switches. He said that by placing in each target a convex lense having a high degree of convexity and a mercury backing, the rays of the headlight on a car would be reflected back with a flickering flame, which could be seen for a considerable distance. He thought it might be necessary to mount the headlight so that it would follow the curve.

President E. C. Spring announced that the Appleyard system of roads had agreed to adopt the interchangeable coupon book of the Ohio Association. This accession is very gratifying, as it will undoubtedly be the means of bringing the other Columbus roads into the agreement. The White Star line of steamers, operating between Toledo and Port Huron, Mich., has also agreed to accept the book. In this connection considerable significance is attached to the acceptance by H. A. Nicholl, general manager of the Indiana Union Traction Company, of a position on the transportation committee of the Ohio Association.

The Drummond Detective Agency presented an outline of a plan for keeping a record of accidents, legitimate as well as fake accidents.

A telegram was read announcing the death in California of Dr. J. E. Lowes, president of the Dayton & Northern and Dayton & Muncie companies and chairman of the legislative committee of the Ohio Association. Several gentlemen who had been associated with Dr. Lowes spoke of his sterling qualities and ability as a promoter and an operator, and a resolution of condolence was sent to his family from the association.

During the afternoon a number of the members accepted the invitation of the National Carbon Company and visited its immense carbon plant. Others visited the new offices of the Roberts & Abbott Company, where there were exhibited plans and photographs of a number of new types of cars; also a demonstration of a new type of smoke consumer.

The last meeting of the association this summer will be held at Cedar Point, Sandusky, June 22. Everything points to this being the banner meeting of the association. Members were urged to bring their wives.

CONDENSED SPECIFICATIONS FOR MUNICIPAL STREET RAILWAY IN CHICAGO

A pamphlet has been published by the city of Chicago containing notice and instructions to bidders and condensed specifications for the construction and operation of the Municipal Street Railway for the city of Chicago. The complete specifications and forms of proposals were prepared by B. J. Arnold, consulting engineer of Chicago, and the pamphlet containing the condensed specifications has been prepared for the convenience of bidders.

The notice to bidders contains the terms and conditions under which the Municipal Street Railway is to be built. These conditions have been published and they have been referred to in the columns of the STREET RAILWAY JOURNAL. Briefly, they are as follows:

The Municipal Street Railway will first be installed upon the following-named streets: Adams Street from Clark to Desplaines; Desplaines Street from Adams to Harrison; Harrison Street from Desplaines to Western Avenue; Western Avenue from Harrison to Twelfth; Twelfth Street from Western Avenue to Crawford Avenue; Halstead Street from Harrison Street south to the center of the Chicago River; Ogden Avenue from Harrison Street to Fortieth Avenue.

Payments for the road are to be made by the city either by the delivery of street railway certificates to be issued under an act of the General Assembly of Illinois or in cash from the proceeds of the sale of such street railway certificates by the city. If bids are submitted upon the basis of payments by means of the delivery of street railway certificates, such bids may be separately submitted on the basis that the city shall itself operate said system or that the city will lease such system to the highest and best bidder, at least one-half of the rental thus obtained to constitute a trust fund to provide an additional security for the payments of the certificates. If the bidder or bidders so elect, bids may be submitted upon the basis that the completed system shall be so leased to such bidder upon a certain percentage of the gross receipts or an amount of cash per year or term of years not to exceed twenty.

All bids must be delivered on or before the first day of July, 1905, and must be accompanied with a certified check for $24,000, which will be forfeited by the successful bidder to the city of Chicago in case the bidder fails to execute the necessary contracts, and in the case of unsuccessful bidders the check will be returned.

The detailed preliminary plans and specifications can be secured from the Commissioner of Public Works upon the deposit with the City Comptroller of a certified check for $1,000, which check will be returned upon the return of the plans and specifications.

The following is a brief digest of the plans and specifications for building the road, upon which bids are invited:

SECTION I.—TRACK WORK

Specifications and drawings for three types of track construction are submitted for bids, to wit: (A) Underground conduit construction; (B) surface concrete beam construction; (C) surface tie construction.

Separate specifications are requested for: (D) Supplying track special work; (E) reconstructing the Adams Street bridge.

A. This specification covers underground conduit construction for double track to be built from Clark Street to Ogden Avenue, and on Halstead Street to the south branch of the Chicago River, aggregating 2.62 or more miles of double track. This section will be built with 9-in. girder grooved track rails, 7-in. Z-bar slot rails, cast-iron yokes spaced 5 ft. center to center, T-iron conductor rails supported every 15 ft. by porcelain insulators. Every 105 ft. a trench and cleaning hand hole will be built. The yokes are to be embedded in concrete, which will also be extended underneath the entire track to a depth of 1 ft. below the bottom of the paving.

B. This specification covers surface concrete beam construction for double track on Harrison Street from Ogden Avenue to Western Avenue; Western Avenue to Twelfth Street; Twelfth Street to Rockwell Street, and on Ogden Avenue from Harrison Street to Albany Avenue, aggregating 1.35 or more miles of double track. The track will consist of a 9-in. girder grooved rail weighing 120 lbs., in 50-ft. lengths, and under each rail will be constructed a Portland cement concrete beam 12 ins. deep, sloped to a connection with a 6-in. concrete foundation under the paving, the concrete beam and paving foundation to be placed at the same time so as to form a monolithic bed.

C. This specification covers surface tie construction for double track to be laid on Twelfth Street from Rockwell Street to Fortieth Avenue, and upon Ogden Avenue from Albany Avenue to Fortieth Avenue, aggregating 1.75 or more miles of double track. The track will be laid with 7-in. girder rails weighing not less than 85 lbs., in 60-ft. lengths, spiked to standard railway ties 6 ins. x 8 ins. x 8 ins., laid 2640 to the mile of single track.

D. The track special work for the three types of construction will be of the renewable hard-center type, and bidders must furnish working plans for each layout in detail.

E. The specification for the reconstruction of the Adams Street bridge and viaduct embraces the reconstruction of the old floor beams and stringers in such a manner as to permit the addition of the new track rails and underground conduit construction.

SECTION II.—PAVING

This section refers entirely to paving the streets covered by the Municipal Street Railway, and bids are invited for granite block, asphalt, brick, creosoted-wood block and cedar block, the conditions under which each paving is to be laid being set forth in the specifications.

SECTION III.—CONDUIT FOR ELECTRIC CABLES

This section covers the delivering and placing of conduits for railway feeders and transmission lines at the side of the car tracks. Vitrified clay conduits laid in concrete are to be used.

SECTION IV.—UNDERGROUND ELECTRIC CABLES

This specification covers the delivering, installing and testing of the underground electric cables for railway feeders and transmission lines. The railway circuit single-conductor cables are to carry 650-volt direct current, and will be supplied in 500,000-circ. mil, 1,000,000-circ. mil and 1,500,000-circ. mil sizes. The transmission circuit three-conductor cables are to carry 22,000-volt a. c. current, and are to be No. 0 and No. 00 sizes. All cables are to have paper insulation or cambric treated with compound, the 650-volt cable to have insulation 4-32 in. thick and the 22,000-volt cable to have 9-32 in. insulation around each conductor and 6-32 in. over all. All cables are to have lead covering 1/8 in. thick.

SECTION V.—OVERHEAD WORK

This specification covers the labor and material for installing and testing the overhead work. There will be overhead work for double track with cross suspension construction, and overhead work for single track with side-pole bracket construction. Poles are to be of iron and steel set in concrete. Span wires to be of 3/8 in. double galvanized strands with insulated hangers, Brooklyn strand insulators at poles and with approved additional insulators in span wire near hangers. Trolley wire to be No. 00 B. & S. gage hard-drawn copper suspended from hangers by mechanical clips.

SECTION VI.—SUB-STATION EQUIPMENT

These specifications cover the sub-station equipment complete, excepting buildings and lighting.

Each rotary converter shall be designed to receive six-phase, 25-cycle alternating current at approximately 425 volts and to transform it to direct current at approximately 000 volts.

The transformers are to be of the air-blast type, with 22,000-volt primary and 425-volt secondary, designed to operate on 25-cycle circuits; capacity to be 375-kw or 200-kw each. Transformers are to be supplied with three-phase current at 22,000 volts, and are to furnish six-phase current to rotary converters.

The blower sets for sub-stations are to consist of a volume blower direct connected to a three-phase, 25-cycle, 425-volt "squirrel-cage" type induction motor. The blower shall be capable of delivering 10,000 cu. ft. of air per minute at 3/4 oz. pressure. The motor shall have an output of 5 kw.

Where motor-generator sets are required for sub-stations, the set is to consist of a 600-volt direct-current motor direct connected to a 125-volt, 15-kw direct-current generator. The motor-generator set is designed to receive direct current at about 600 volts and to furnish direct current at about 125 volts for operating remote control apparatus, a small number of lights and charging storage battery in sub-station.

Where storage batteries are installed, the battery is to consist of sixty cells of 150-amp.-hour capacity, capable of discharging at the rate of 15 amps. for a period of ten hours. The battery is to be used in furnishing current for the control apparatus in sub-station and for lights.

The switchboards, switching equipment and wiring for sub-stations are included under this section.

The plans and specifications under which all of the work in sub-stations is to be done are very complete, and detail instructions as to how each part of the work is to be installed are given.

SECTION VII.—ROLLING STOCK

This specification covers passenger cars, street sweepers, snow plows, sprinkler and repair wagons and contact plows.

The passenger cars are to contain as little combustible material as possible, and at the same time to possess every advantage of lightness, strength, comfort and durability consistent with the present art of building a non-combustible car. Each car is to have a comfortable seating capacity of not less than forty-eight nor more than fifty-two passengers, and standing room as large as consistent with the design. The air brakes are to be of the straight-air type, with motor-driven compressor on each car. The wheel base of the trucks is to be not more than 6 ft. nor less than 4 ft. 6 ins. Wheels to be 33 ins. in diameter, with 5/8-in. flange and 2½-in. tread. Car bodies and trucks to be designed to provide ample clearance on a 40-ft. radius curve. Wheels are to be of chilled cast iron, but bidders may give extra price on rolled-steel and steel-tired wheels. Axles are to be not less than 5¼ ins. in diameter and to be of hammered steel.

Each car is to be provided with four motors of sufficient capacity to operate the car under extreme conditions of schedules and speed in regular city service continuously.

SECTION VIII.—BUILDINGS

These specifications cover all labor and materials for building the car house and equipment, repair shops and equipment, sub-station buildings with crane, and power house building with crane, chimney, coal and ash-handling equipment, etc.

The car house is to consist of two compartments with fire wall between, the building to be entirely of reinforced concrete. The lighting and ventilating is to be done by the fan system with motor-driven fans.

The main car shop is to be built with a main center span provided with a crane and two side spans. The specifications cover the requirements for foundations, floor, frame, walls, roof, doors and windows. This building is to contain the blacksmith shop, the stock room, office, tool room, lavatory, machine shop, electrical department, and repair tracks provided with pits and a drop pit for removing wheels.

The paint shop is to be built in separate compartments fitted with rolling doors. The construction is to be entirely concrete. The roof is to be of the saw-tooth type.

SECTION IX.—POWER-PLANT EQUIPMENT

This specification includes all labor and material required to construct, install and test the complete power plant equipment.

This section is divided into eighteen sub-sections, as follows: (A) Turbo-generators; (B) compound reciprocating engines; (C) engine-type alternators; (D) boilers and superheaters; (E) stokers and furnaces; (F) jet condensers; (G) surface condensers; (H) turbo exciter; (I) induction motor exciter; (J) exciter engine; (K) engine-type exciter; (L) boiler feed-pumps; (M) feed-water heater; (N) piping; (O) switchboards and instruments; (P) cable work; (Q) switch house equipment for power plant; (R) oil-cooled transformers.

The specifications for the turbo-generators require that the machines are to be designed to furnish three-phase alternating current at 25 cycles per second at 22,000 volts. Each generator will deliver 3000 kw, and will be capable of standing tests at 25 per cent and at 50 per cent overload within the limits of heating specified in the detail specifications. The steam pressure is to be 175 lbs. per square inch, superheat 150 degs. F. and vacuum 28 ins. at full load. The turbines are to be designed for parallel operation. Turbine generator to be arranged for control from the station switchboard by an electric speed-changing device, speed variations to be not more than 2 per cent from full load to no load, and vice versa. As to efficiencies, bidders are invited to submit their best guarantee of duties in pounds of water per electrical horse-power, both with superheated steam and with saturated steam, and the efficiency of the generator at all loads.

The specifications for compound reciprocating engines require that they are to be of the cross-compound Corliss heavy-duty type for direct connection to alternating generators of the revolving-field type, which are to be located between the cranks of the engines. The generators are to deliver the same kind of current at the same voltage as specified under the turbo-generators. The reciprocating engines are to work under the same conditions of steam pressure and superheat as specified for the turbines, except they are to work with a vacuum of 27 ins. The bidder is to state the best guarantee he will make under all conditions of load with respect to indicated horse-power, cut-off in high-pressure cylinder, cut-off in low-pressure cylinder, revolutions per minute, economy with superheated steam and economy with saturated steam. The performance required of the generators is set forth in the specifications, but the bidders are instructed to state their best guarantee under all conditions of load.

The boilers are to be of the water-tube type, each boiler to have a minimum heating surface of 10 sq. ft. for each boiler horse-power. The normal steam pressure will be 200 lbs. gage pressure. The maximum steam pressure 250 lbs. Superheat to be 200 degs. F. The draft equivalent to .8 in. of water. Each boiler is to be equipped with a superheater of the flue-fired type.

The specifications for the balance of work to be done under Section IX. are set forth in detail.

SECTION X.—TELEPHONE SYSTEM

This specification covers the furnishing and installing of a complete telephone system for the Municipal Street Railway.

The condensed specifications contain a large number of maps, diagrams and other drawings for explaining the work to be carried out under the various sections.

CLASSIFICATION OF FREIGHT ACCOUNTS IN BIRMINGHAM

The classification of freight accounts has not yet been taken up by the Street Railway Accountants' Association of America, so that the practice of individual companies in this respect is of great interest. The Birmingham Railway & Light Company, of Birmingham, Ala., has carried freight on its lines for some time, and the necessity for a classification of its freight accounts has recently become very apparent. The accompanying classification was prepared by consultation between the resident accountant, C. O. Simpson, and W. B. Brockway, general auditor of the Newman properties in New York, and has just been put in force by the company:

CLASSIFICATION ON FREIGHT ACCOUNTS FOR THE BIRMINGHAM RAILWAY, LIGHT & POWER COMPANY

201. Maintenance of Track and Roadway:

Charge to this account proportion of maintenance of track of the railway department, on a car-mileage basis.

202. Maintenance of Electric Line:

Charge to this account proportion of expenditures for maintenance of electric line, on a car-mileage basis.

203. Maintenance of Buildings and Fixtures:

Charge to this account all expenditures for repairs and renewals of buildings and fixtures used in the operation of the freight property only. Includes labor, material, water, tools, hauling of material and all other expenses incident to the work.

206. Maintenance of Cars:

Charge to this account all expenditures for repairs and renewals of baggage, express, freight and slag cars, from the operation of which revenue is derived in the freight department. Repairs and renewals of the electrical equipment should be charged to account No. 207.

207. Maintenance of Electric Equipment of Cars:

Charge to this account all expenditures for repairs and renewals of the electric equipment and wiring of baggage, express, freight and slag cars, from the operation of which revenue is derived in the freight department, including labor, material and other expenses incidental to the work.

209. Miscellaneous Shop Expenses:

Charge to this account, on a car-mileage basis, proportion of expenditures of account No. 9 of the railway department.

210. Power:

Charge to this account on a car-mileage basis, proportion of expenditures of the operation of the power plant as covered by accounts Nos. 10, 11, 12, 13 and 14 of the railway department.

216. Superintendence:

Charge to this account, on a car-mileage basis, proportion of account No. 16, superintendence of transportation.

217. Wages of Motormen:

Charge to this account wages of motormen engaged in the operation of cars for the freight department.

218. Wages of Trainmen:

Charge to this account wages of messengers, brakemen, car couplers and other car service employees in connection with the operation of freight trains, except motormen, which should be charged to account No. 217.

219. Agency Service:

Charge to this account wages of agents, checkers, cashiers, janitors and porters at the different stations.

220. Wages of Car House Employees:

Charge to this account, on a car-mileage basis, proportion of account No. 20 of the railway department.

221. Car Service Supplies:

Charge to this account, on a car-mileage basis, proportion of account No. 21 of the railway department.

222. Agency Expense:

Charge to this account all miscellaneous expenses at the different stations, such as rent, fuel, light, water, ice, office furniture, except printing and stationery, which should be charged to account No. 227.

226. Officers and Clerks:

Charge to this account the wages of the freight traffic manager and clerks at the general office whose duties are in connection with the freight department.

227. Printing and Stationery:

Charge to this account the actual expenditures for printing, stationery and stationery supplies for the freight department.

231. Advertising and Soliciting:

Charge to this account the actual expenditures for advertising the freight business and salary and expenses of the solicitor.

232. Miscellaneous General Expense:

Charge to this account the actual expenditures for telephone service, proportion of maintaining and operating a private telephhone system, telegrams, subscriptions and donations on account of the freight department and contingent expenses connected with the management of the department not otherwise provided for.

233. Damages:

Charge to this account all expenditures on account of damages to persons and property and loss of freight in transit.

238. Insurance:

Charge to this account the actual cost of fire insurance on buildings and cars used in the operation of the freight department.

REPAIRING STEEL MOTORS, AND OTHER ELECTRICAL SHOP NOTES

BY ARTHUR B. WEEKS

The mechanical defects of earlier makes of street railway motors show themselves occasionally in very exasperating as well as expensive ways. For example, many suburban roads are equipped with the steel motor, which is no longer made; yet, while there is a certain mechanical defect in the armature construction of this motor, it can be remedied as follows:

As constructed, an unusually severe strain will often loosen the armature core so that it will shift on the shaft, allowing the armature to strike the frame, thus tearing things up generally. This is a frequent occurrence. The core key is not cut into the shaft, as would have been by far the better way; the key itself is ¾ in. x ¼ in. One improvement is to cut the key way to accommodate a ¾-in. x ½-in. key, leaving enough of the key projecting to admit of putting a 5-16-in. headless screw into the key and the shaft, and sinking the screw just below the surface of the key. The metal should next be turned over the screw with a hammer, to prevent the screw from ever working out, even though it work loose. This, however, is not likely to occur. Many shops have not the necessary means for making these repairs, and it is often best to send the armatures to a reliable armature repair works.

As to rewinding this armature, there is no support for the projecting coils at the pinion end, and it is best to place a wooden block here temporarily, while inserting the coils, having the block high enough so the finished coils will not slope downward when completed. Should no block be used, or should it be too low, there is a liability of getting too much slant, making it difficult to retain the armature band in place, even with extension clips. This is a common source of trouble with these armatures when not properly wound. Important as it is, this part of the work is often overlooked. One case that came to notice was that of a winder who had trouble with the armature bands coming off such armatures. This was followed by the eoils flying out and striking the pole pieces, with a complete loss of the windings. He thought the trouble was due to a finishing paint he had just purchased, and it was so reported; but on investigation the fault in winding was diseovered.

On armature and field coils for street railway use, all street railway eompanies demand that the highest grade of insulating paint be used, whether clear or black; but many are not at all particular as to the finishing paint. The coil paint must be of a certain standard of flexibility, and withstand expansion and contraction without injury, enduring also a high heat test; but for the important detail of the armature's exterior any cheap paint is frequently used. The finishing paint should possess a eertain degree of flexibility, and not chip off and allow moisture to work its way into the armature.

It is sometimes claimed that moisture cannot reach an armature where enclosed motors are used, whether in a car house or left out of doors, as is the practice in some cities. This idea is incorrect, and it is well known that water comes in contact with the motor by condensation. Where the pits are not heated, the motors become covered with sweat. Running through wet streets, the lower portions of the cars being soaked with snow or water, the motors are affected to a very considerable extent. One authority even states that ammonia rising from the pavements attacks motor insulations.

Lightning can more easily puncture an armature finished with a cheap paint, like asphaltum, for instance, than one on whieh a high-grade insulating paint has been used. Motors on suburban lines in some seasons have more burn-outs from lightning than from any other cause.

PRIZES OFFERED BY THE BOSTON & NORTHERN AND THE OLD COLONY STREET RAILWAY FOR THE BEST PHOTOGRAPHS ALONG THEIR LINES

Along the lines of the Boston & Northern and the Old Colony Street Railways there are to be found some of the most beautiful places in all New England. There are pieces of woodland that rival in beauty, if not in size, views in the Adirondacks. There are seaside places where the long stretches of sand and the rocky shores have been a delight to the traveler's eye for years. There are parks and groves that attract hundreds every day. There are rivers and lakes whose beauties have been sung in song and story. Some of these places have been photographed many times. Others have not yet been discovered, save by the amateur photographer who has kept the views for his own satisfaction. To secure these views the railway companies have decided to offer the following prizes for the best dozen views submitted.

The contest will be governed by the following conditions:

Photographs must not be less than 4 ins. x 5 ins., nor larger than 8 ins. x 10 ins.

They must be printed on matte surface paper and mounted.

On the back of each must be plainly marked the location of the photograph, the name and address of the sender.

All photographs to become the property of the Boston & Northern and the Old Colony Street Railways.

In order that the photographs winning the prizes may be selected by a committee whose judgment will be at once recognized, the following gentlemen have been selected and have accepted to judge the contest, which will close Sept. 1:

Thomas Harrison Cummings, editor "Photo Era"; George R. King and F. E. Bowman.

Five prizes are offered. They are in order: $50, a bicycle, a leather arm chair, an Eastman kodak, a pim racket and case and a dozen balls.

REPORT ON EFFICIENCY OF 400-K. W. STEAM TURBINE

The report of a test on a Westinghouse-Parsons steam turbine direct connected to a Westinghouse 400-kw alternator, conducted for the owners, Joseph Benn & Sons, of Providence, R. I., by F. P. Sheldon & Co., consulting engineers of that city, has recently been made public. The object of the test was to determine whether the builder's guarantees as to steam consumption at various loads were fulfilled. The results are given in the accompanying table. The efficiencies obtained were better than those given in the manufacturer's guarantees by from 6.7 per cent to 10.9 per cent.

The high economy shown on large overloads was obtained by the use of an automatic secondary governor which began to operate at 15 per cent overload. The extreme variation in speed between one-half and twice load was 2.95 per cent.

The superheat runs indicated that the steam consumption is reduced approximately 10 per cent for every 100 degs. F. superheat. The generator test showed that this machine varied in efficiency from 94.6 per cent at half load to 96.6 per cent at full load.

TABLE SHOWING RESULTS OF TESTS ON WESTINGHOUSE-PARSONS STEAM TURBINE—400 KW.=580 B.H.P. RATED FULL LOAD CAPACITY.

TURBINE NO. 68.	Superheated Steam.						Saturated Steam.				
	28-Inch Vacuum, 150 Pounds Pressure.						28-Inch Vacuum, 150 Pounds Pressure.				
Nominal load	Twice Full Load.	1½ Load.	1¼ Load.	Full Load.	¾ Load.	½ Load.	Twice Full Load.	1¼ Load.	Full Load.	¾ Load.	½ Load.
Steam pressure (gage) near throttle—Lbs. per square inch	152.	149.6	153.2	152.7	153.2	153.1	150.85	151.6	152.6	154.8	154.7
Vac. refd. 30-inch barometer—in. Hg	27.28	27.62	28.03	28.03	28.03	28.03	27.02	28.07	28.04	28.03	28.07
Superheat at turbine—°F	99.9	100.2	93.1	100.25	102.9	92.5	2.3	.75	2.9	1.8	2.9
Speed—r.p.m	3454.5	3460.8	3486.	3502.8	3532.2	3561.6	3496.1	3500.3	3513.3	3571.3	3597.3
Brake hp developed—hp	1207.5	967.5	777.6	657.3	410.7	279.4	1165.6	725.9	660.	414.6	281.6
Per cent. full load rating—Per cent	208.	167.	134.	113.	71.	48.2	201.	125.	114.	71.5	48.5
Steam per B.HP per hour—Lbs	13.55	12.79	12.41	12.48	13.45	14.34	15.12	13.85	13.89	15.05	15.86
Steam per B.HP hour (corrected for 28-inch vacuum)—Lbs	13.19	12.61	....	....	....	....	14.7	....	....	....	....
Efficiency* B.HP per cent. Int. hp—Per cent	96.21	95.3	94.2	93.4	89.7	85.5	96.1	93.9	93.3	89.7	85.6
Steam per Internal hp per hour—Lbs	12.7	12.02	11.7	11.65	12.06	12.25	14.12	13.	12.96	13.5	13.58

* Based upon an efficiency of 92½ per cent. at full load.

UNITED RAILROADS OF SAN FRANCISCO OPENS CLIFF HOUSE LINE

The opening of the new double-track electric line of the United Railroads of San Francisco to the Cliff House was fittingly celebrated May 27. The first trip was made by two special cars, in which were President Arthur Holland, Manager George F. Chapman and other officials and invited guests, including Mayor Schmitz, the Board of Public Works and the Supervisors. Stops were made at several stations along the line, and on arrival at their destination the party were entertained at luncheon at the Cliff House. This line, skirting as it does the picturesque hillside along the strait leading out to the Golden Gate, is conceded to have unexcelled scenic attractions. As soon as arrangements can be perfected, the company will begin the work of equipping its Sutter Street cable line with electricity.

COUNTERWEIGHTS FOR LARGE ENGINES*

BY D. S. JACOBUS

The writer was called upon to investigate the problem of lessening the vibration of the engines at the new power plant at the Manchester Street station of the Rhode Island Company, Providence, R. I., and working conjointly with Fred N. Bushnell, the chief engineer of the company, he recommended that certain counterweights be added in addition to those already on the engines. These counterweights, which were exceptionally large, were adopted and gave satisfactory results. In addition to this problem, certain electrical problems arose regarding the effect of the counterweights in increasing the variation in angular velocity of alternating-current generators run in parallel with each other. A number of measurements were made to determine the action of the counterweights, both as affecting the vibration of the building and the tendency of the alternating-current generators to break apart when run in parallel.

The counterweights were applied to three engines, all of which were of the same cylinder dimensions and had the same weights of reciprocating parts. The engines were built by the Filer & Stowell Company, of Milwaukee, Wis., and were of the horizontal cross-compound type, direct connected to electrical generators. Two of the engines, designated as Nos. 1 and 2, were connected to 1500-kw a. c. generators, and one, designated as No. 3, to a 1600-kw d. c. generator.

On inspecting the plant it was evident that something should be done to diminish the shaking. The entire building rested on piles which passed through silt for about 30 ft. before striking a solid bottom. There was a mass of concrete about 5 ft. thick placed on these piles, which extended under the entire plant, so as to form a bed on which rested the foundations of the buildings, boilers and engines. The bed of concrete also extended under the chimney foundation. When the first observations were made the buildings were not completed. All three engines were, however, installed and were protected by a temporary wooden structure. The boiler plant was in the process of construction, much of the brick work having been laid, and the steel frame work of the building nearly completed. A portion of the boiler plant was running to supply steam to one of the engines. The Custodis chimney, which was ultimately to be about 300 ft. high, was being erected.

After inspection, the writer eonstructed an apparatus on the principle of the seismograph for measuring the amount of vibration. On a second visit to the plant the horizontal shake of the foundation was measured with this instrument with engine No. 3 running, and found to be 0.01 in. at the engine. This may not seem to be a large amount, but as the entire mass of the building foundation shook, the movement of parts of the temporary wooden building was magnified in many places so as to be very evident to the eye. Furthermore, the iron work of the boiler house shook considerably. That the entire mass of the foundation shook could be appreciated by feeling the vibration through the feet, and also by measuring the actual amount at different points with the special apparatus. At a point near the extreme end of the foundation, where the No. 1 engine was located, the foundation was found to shake 0.008 in. Measurements made near the top of the chimney, which was erected to the height of about 175 feet above the ground, showed that the maximum shake with the engine running at its ordinary speed of 90 r. p. m. was about 0.02 in. After measuring the vibration of the chimney with the engine running at its ordinary speed, the engine was shut down and a marked result took place when its speed fell in harmony with the time of vibration of the chimney. When this occurred, the chimney shook to such an extent that the motion was beyond the range of the special instrument. The total movement of the pointer of the instrument was such that the chimney was shown to move more than 1/8 in. In constructing the chimney the workmen had notieed that when they came to a height of about 130 ft. the vibration was much greater than it was after the ehimney was built higher. This made it appear that at the height of 130 ft., at which there was the most shaking, the time of the vibration of the chimney was in harmony with the number of revolutions made by the engine.

As the entire plant shook laterally on top of the piles, and as there could be no vertical movement, it appeared evident that the best plan would be to place counterweights on the engines of such sizes that they would diminish the horizontal shaking forces to nearly a minimum, irrespective of the vertical shaking forces which might be produced. This would give much larger counterweights than are ordinarily used, but on carefully considering the eonditions which existed it was deemed best to adopt them. The counterweights originally on the engines were comparatively small and it was found impossible to place large enough weights on the crank discs to carry out this plan. It was therefore decided to place counterweights on the fly-wheels in addition to placing as heavy eounterweights as possible on the crank discs. A counterweight in the fly-wheel acts just as efficiently as one placed on the erank disc in eliminating the shaking forces tending to translate the bed of the engine, but with such a counterweight there remain forces which act as couples and tend to shake the engine by rotating it about its center of mass. The horizontal forees tending to produce translation were, however, the most important in the case under consideration, and these were eonsidered irrespective of the forces tending to produce rotation.

The weight of the counterweights recommended to be added in addition to those already on the No. 3 engine was 4995 lbs. on each of the crank discs and 3600 lbs. in the fly-wheel, the distance of the center of gravity of the weights on the erank discs from the center of the shaft being 2.38 ft. and for the weight in the fly-wheel 7.67 ft. The counterweights originally in each crank disc amounted to a net weight of 1740 lbs. at 2.05 ft. The counterweights finally placed on the engine were somewhat lighter than called for, but not enough so to produce any great difference in the results. On starting up the No. 3 engine with the counterweights it ran without appreeiable vibration and operated with entire satisfaction. Similar tests were also made with engines Nos. 1 and 2.

It appeared that the fluctuations in the current generated by the two alternating machines had but little influence on their efficiencies and that they were working successfully when eonnected in parallel. The writer did not wish, however, to give an opinion on the electrical side of the problem and arranged with Prof. Albert F. Ganz, the professor of electrieal engineering of the Stevens Institute, to accompany him at the time of making the final measurements. On a joint visit of Prof. Ganz and the writer, observations of the angular displacement of the rotating fields and electrical readings were again taken, and these observations led Prof. Ganz to eonclude that there was no apparent danger of the alternators breaking out of step while operating in parallel with the counterweights in any relative position.

It appears that by placing the counterweights in the revolving fields the angular variation during a single stroke is made about twice what it would have been without the counterweights. It, however, appears that the increased angular variation during a single stroke, due to employing the eounterweights, does not introduce any great disadvantage, as the alternators can be safely run in parallel at practieally the same efficiency as would exist should there be less angular variation.

* Abstract of paper presented at the Scranton meeting (June, 1905) of the American Society of Mechanical Engineers.

CAN A STEAM TURBINE BE STARTED IN AN EMERGENCY QUICKER THAN A RECIPROCATING ENGINE OF THE SAME POWER?*

BY A. S. MANN

If a large steam turbine is cold and at rest, how quickly can it be started? Can it be brought up to speed as readily as can a good cross-compound engine that is cold all over? Most station men would have doubts as to the adaptability of the large turbine, say 1500 kw or 2250 hp, for emergency work. So much has been written about the sensitiveness of a rotating disc to the changes of temperature and the effects of unequal expansion that it is easy to imagine difficulties in the rapid start. The possibilities of an engine with a 62-in. low-pressure cylinder in starting practically cold and coming up to synchronous speed are well understood. A station manager would criticise an engineer who would open his throttle as fast as he dared without wrecking his piping system and let his machine jump into her work. One turn at a time on the throttle is about all that is considered safe, and even then a close watch is kept for groaning valves and cold back bonnets.

Every time the starting valve is moved to increase the steam flow the engine is allowed to take its full increment of speed, due to that particular throttle position before the supply valve is moved a second time. There are ten large oil cups, and frequently more, that must be opened and adjusted before the machine moves at all, beside whatever oiling is to be done about the air pumps and other auxiliary apparatus.

Most engineers would consider ten minutes as rather a fast start and fifteen minutes as a more usual starting period, including time taken for warming up; in fact, it may not be overstating the case to say that if it were known that an engine-driven plant were to be called upon in emergency for power and it were essential that the briefest possible time were to elapse between the call and the taking of the load, one or more engines would be kept in motion all the time, turning slowly and hot all over.

This question makes itself very prominent when the steam station is operated as an auxiliary to a large source of high-tension power, which is itself in the construction stage and has a large overload capacity of its own to carry, supplying all sorts of apparatus that use electric power, railway, lighting and power circuits simultaneously. At such a time all sorts of accidents will happen to the high-tension water-driven plant, most of them due to the necessarily temporary character of many of the electrical connections.

The station at present under consideration is equipped with three Curtis turbine-driven alternators, 40 cycles, 10,000 volts, each of 1500-kw normal capacity. During the summer months the station is operated as an auxiliary to a water-power plant, taking all sudden overloads. A signal has been arranged, a ¾-in. whistle, so that it can be blown instantly should the power fail. A blast of that whistle means—cut in two turbines and bring the third up to speed. The load will be heavy, and all auxiliary apparatus must be in regular operation. Each turbine has a surface condenser, and there are three or four pumps to be started for each pair of turbines; one circulating pump, one combined hot-well and feed-pump, one pressure pump for the step bearings and one dry air pump, all of which are motor driven. The exciter is driven by a steam engine, and must be started also, for it supplies current to a portion of the auxiliary apparatus.

The boiler room has steam up at all times, supplying a system for manufacturing purposes other than power, and slow fires are kept in enough boilers to make steam needed for the normal load. Forced load means forced fires. The boilers have under-feed stokers, equipped with pressure blast, and will respond quickly to a 50 per cent excess call for steam. The operating force for this about equals one for an engine plant.

At the sound of the whistle the water-tender starts a blower on the extra row of boilers; all blast dampers are opened up and all stokers are allowed to feed at the maximum rate. Each fireman dumps his free ash and bars over his red fire. The man in charge of the coal and ash conveyor starts the pressure pump for step bearings. One of the turbine men starts the exciter which supplies current to the auxiliaries beside its field current; a second turbine man starts the circulating pump and then his turbine. The hot-well pump and the air pump are started by the oiler. These movements take place simultaneously. The force is organized upon the lines that obtain in a fire station; each man has his specific duty, and after performing it looks to see that there is nothing more for him to do. Only a few seconds elapse between starting the first pump and starting the first turbine. The turbine throttle is opened as fast as an 8-in. steam valve can be opened without endangering the steam piping system. It is not considered advisable to open the throttle valve as fast as a man's strength will permit; but if nothing unusual occurs in the pipe line, sentiment does not spare the turbine.

One electrician attends to the switchboard and telephone. As soon as the machine approaches speed, the synchronizing system is cut in and the main switches are got ready. One and one-half minutes will do the work here outlined, including the time taken in mustering the crew.

Manipulating an engine regulator so that it shall be at a precise speed and at an exact phase relationship from some other machine, not more than 1-1500 part of a second removed from it, is no matter that can be hurried, and one minute is fast time on such work. But the whole thing, phasing-in and all, has been done in two and one-half minutes, including full load on the turbine, which started from a standstill. This performance has been gone through a great many times, and our record book shows that, out of forty-three such calls, ten starts were made in two and one-half minutes, eighteen in three minutes, and fifteen in three and one-half minutes.

We have taken the time in a number of instances when all the auxiliaries have been in motion and it only remained to start the turbine and phase it in on the line; the only valves to open in such cases are the throttle and one small oil valve. The two quickest starts have been made in forty-five seconds and seventy seconds, respectively, including phasing-in. Others range between one minute ten seconds and one and one-half minutes. These two quickest starts were made on a turbine which had stood for twenty-four hours with the throttle valve shut tight, though there was a slight leakage past the seat. After the throttle valve is off its seat, it is not more than thirty seconds before the turbine is up to speed. A cross-compound reciprocating engine of the four-valve type, 2250-hp capacity, can be brought up to speed from a standstill in five minutes if it is hot all over. This five minutes is to be compared with the seventy seconds required for the similar turbine operation.

A reciprocating engine which is turning over slowly with the throttle valve just off its seat or with by-pass open and having all its oil cups open and regulated, can be brought up to speed, say seventy-five turns, in two and one-half minutes. This can be compared with the thirty seconds necessary for bringing the turbine up under the same conditions—that is, about one-fifth the time necessary for bringing up the engine. If the engine is cold all over and has all its oil cups shut tight, all its auxiliaries quiet, fifteen minutes is called a rapid start. Starts have been made under such conditions in twelve minutes. When we start a cold turbine, we open up the valve and let her turn, and in two minutes we are ready to bring her up to speed, and she will be at speed in two and one-half minutes, dividing the engine's time by more than four.

* Abstract of paper presented at the Scranton meeting (June, 1905) of the American Society of Mechanical Engineers.

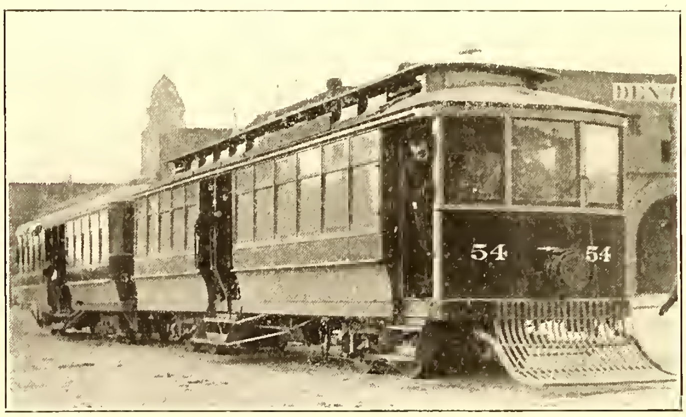
THE QUESTION BOX

The Question Box this week contains a very interesting communication on the subject of trail cars. There are also included descriptions of two methods of keeping general operating and construction data and records, and two methods of keeping records of employees.

A.—GENERAL

A 17.—At one time the use of trail cars was quite general on electric railways throughout the country. Then came a period when the running of trailers was looked upon with more or less disfavor. There seems to be a decided tendency at the present time to go back to trailers. Please give your ideas and experience relative to trailers. Under what conditions do trail cars properly find a place in the operation of a modern electric railway? Do trail cars cause a greater number of accidents? If they do, what can be done to make them safer? What is the economy in running trailers?

About a year ago we commenced the use of trailers in connection with our four-motor cars. At first we used a number of old seven-bench open cars, as trailers, and operated them as smoking cars. We took off the running board and closed up the left-hand side with guard rails, running cars the same end front all the time, and we found that they operated very satisfactorily. Since then we have put on a type of long trailer, 41 ft. 6 ins. long, the same length as our standard car, with cross-seats and side entrance in the middle of the car, on one side only. This car seats 52, and during the rush hours has hauled as high as 190 passengers. This trail car might be termed semi-convertible as it has large windows which let down into the pockets. It has cross seats and an aisle up the center. We use it all the year around. The first one that we made weighed 19,300 lbs., which was a little heavier than necessary, but it was an experiment and we thought that we might possibly have to attach motors to it later on, but we find that we can run this car during rush hours morning and night, and also on holidays and days of heavy travel as a trailer without heating the motors on the motor car. We have recently placed an order for a number of these trail cars, but have reduced the weight of the cars considerably. The new trailer cars will weigh 10,000 lbs. complete. They are 36 ft. long and seat 44 passengers. One of the chief advantages of running trailers is that the trail car requires but one man to operate it. We place a conductor on each trail car, thus reducing the extra



MOTOR CAR WITH CLOSED TRAILER AT DENVER

list to one-half. A very large economy is also affected in power, the consumption of power being in the ratio of the weight of the trailer to the weight of the motor car. In other words, we find that our ordinary four-motor car consumes 2.5 kw-hours per car, measured at the car motor, without a trailer. With a small trailer, .6 kw-hour additional is used, and with a long trailer about 1 kw-hour additional is consumed. This materially reduces the expense per car-mile. It also greatly reduces the necessary investment in motor equipment and rolling stock, and consequently reduces the fixed charge.

As regards accidents, we have as yet had no accidents on account of the trailer, and since attaching the trailer under these conditions our accidents have been diminished, but whether we can attribute this entirely to the trailer or not is a debatable question. In Denver, we use a peculiar type of car. Our standard car has an entrance at the middle of the car at one side only.

With respect to brakes with the long trailers, we connect them up with the air-brake system of the front car. We use the Christensen straight air brake. The light open trailers, the weight of which is 5600 lbs. are equipped with ordinary hand brakes.

We have found it possible to lighten up the dead-load of the trailer very materially. In other words, a motor car weighs 36,500 lbs. and accommodates very nicely 100 people; that is 365 lbs. dead-load per passenger. The trail car has a weight of 10,000 lbs., and will accommodate 100 people, giving a dead-load of 100 lbs. per passenger, thus reducing the dead-load per passenger nearly three-quarters.

On some of the lines when running trailers we lengthen out the

MOTOR CAR WITH OPEN TRAILER AT DENVER

schedule, giving a little longer time in which to make the trip, but we maintain the same or more frequent headway between cars by putting on extra units.

JOHN A. BEELER, V. Pres. and Gen. Mgr.,
Denver City Tramway Co.

A 17a.—If trail cars are used, should cars be equipped with some form of multiple-unit control? If so, would you favor putting four motors on the first car and none on the second, or two motors on each car, or four motors on each car? What are the factors entering into the question?

Under our conditions I would favor the multiple-unit control where there is likelihood of more than two cars being required. But I would think that at least every other car could be a trailer car without motors, and it would seem to be preferable to keep the four motors all on one car. The cost of maintenance would be less, and when you were not using the extra cars you would simply have to house the trail cars, and there would be less liability of a great loss in case of fire. You would also have the advantage of keeping your motor equipments out on the road all the time, and with four motors to the car you could, under certain conditions, run certain lines at a higher rate of speed during certain hours, if necessary.

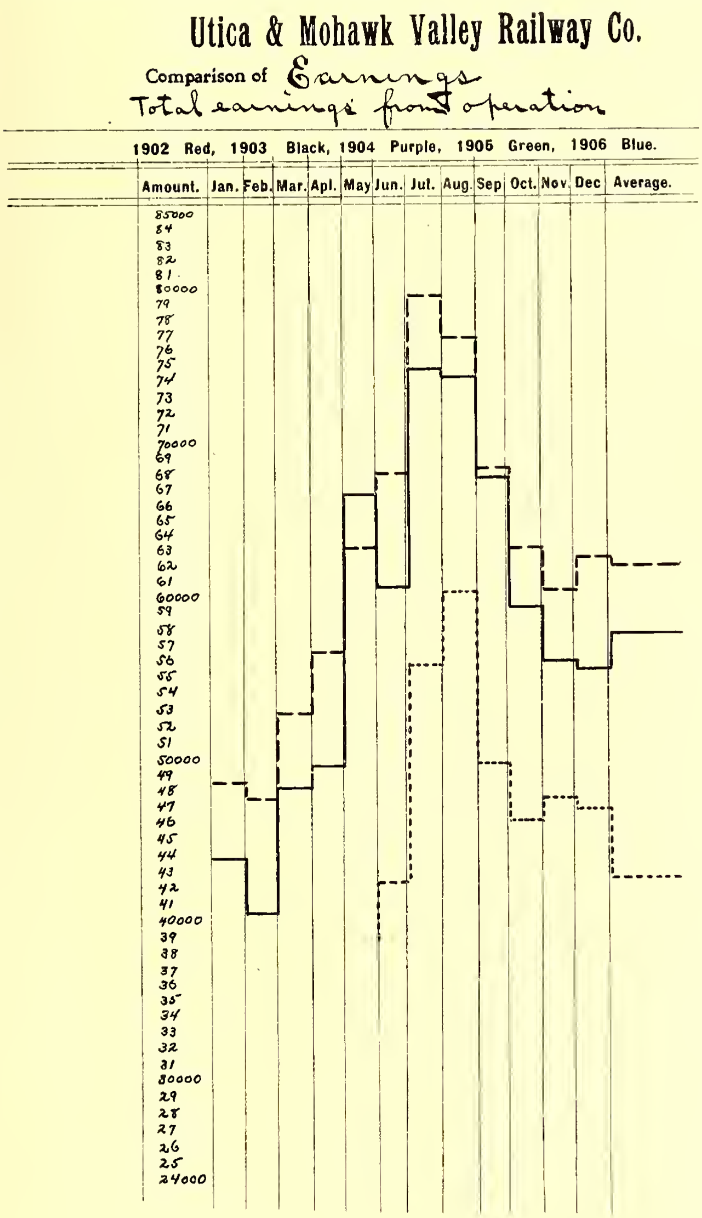
JOHN A. BEELER, V. Pres. and Gen. Mgr.,
Denver City Tramway Co.

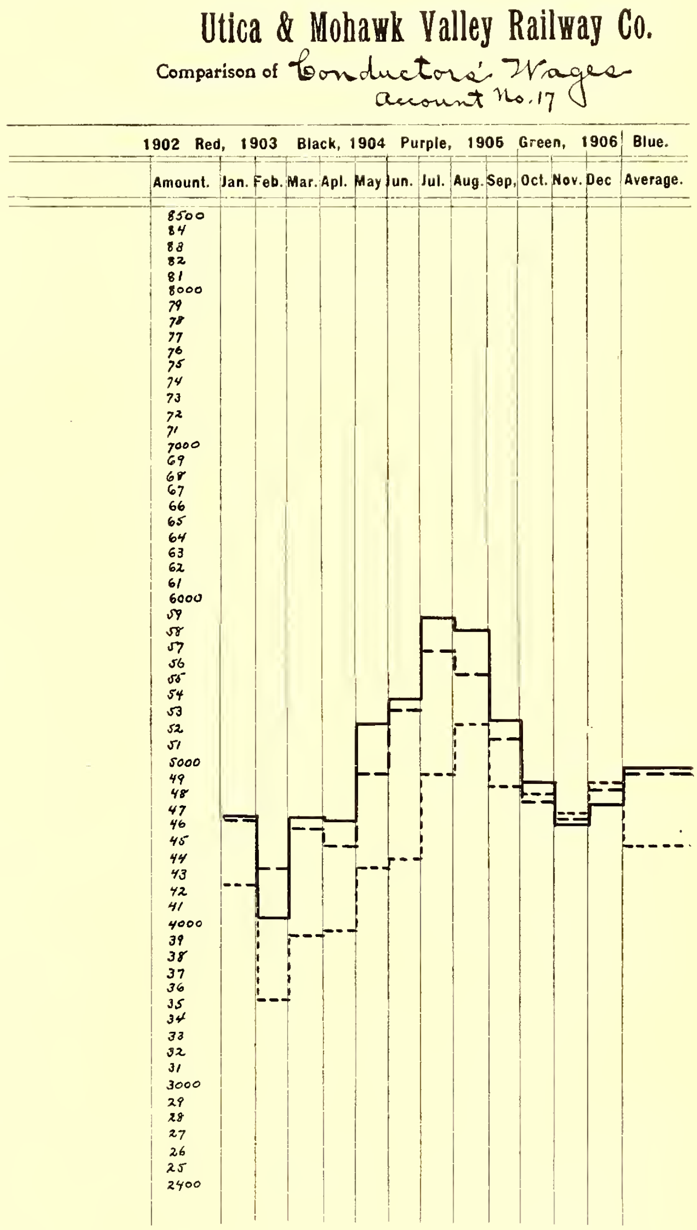
A 47.—Have you worked out any special form of hand book or note book by which the manager can keep in convenient shape for quick reference the various data and statistics relative to his property, such as comparative receipts, car mileage, station output, etc.? How do you keep this information? Sample pages or sheets from your book, with description, will be appreciated.

The STREET RAILWAY JOURNAL has had occasion frequently to point out the advantages, for purposes of making comparison, of plotting financial, operating and physical property data and records in the form of curves or diagrams. Probably every street railway man has realized at one time or another how difficult and unsatisfactory it is to attempt to draw intelligent conclusions from a mass of figures and statistics, for the very size and bulk of the sheets necessary to display any extended array of figures make the examination and comparison extremely inconvenient.

The value of reducing these data to curves is well illustrated by the sample sheets reproduced on this page, which were taken at random from a data book used by C. Loomis Allen, general manager of the Utica & Mohawk Valley Railway Company, and in which is kept complete financial, operating and other records for the entire property for a series of years. The pages of this book are 4 ins. wide by 7¼ ins. high, and are ruled to give the figures for each month for a period of five years. The sheets are bound on the loose-leaf system. The same ruling is applicable to keeping all of the various kinds of records. At the left of each sheet is a column headed "amount," and in this are entered a series of progressive units, the units being selected to give the best facilities for reducing the particular record to diagrammatic form. For instance, for the sheet headed "Earnings from Operation," the unit selected is "dollars," and each of the cross rulings represents a progression of $1000. For the comparison of conductors' wages the unit is also "dollars," but each space represents an interval of $100. In the same way the column headed "amount" would be filled out on the most desirable basis, as for instance, number of kilowatt-hours for power statistics; car-miles or car-hours for detail statistics, etc. Each month the total for the month in each particular instance is indicated by drawing a straight line across the column for the given month, and in this way progressive curves are obtained. The comparison for the different years is obtained by the use of colored crayons, for instance, the curve indicating the 1902 statistics being drawn in red; for 1903 in black, for 1904 in purple, for 1905 in green, for 1906 in blue. On the sample sheets shown here, however, the curves for the different years are indicated by symbols, as it would be impossible to reproduce the curves in colors. As a matter of fact, for keeping the records the symbols may be used instead of the different colors, if it is so desired, but it is believed that the color scheme gives better contrast and permits comparisons to be made more easily. The extreme right-hand column gives the average for each year.

Mr. Allen states that this method of keeping records for ready comparison has proven of the utmost value to him. He does not claim the scheme as original, but gives credit to an article which was published in the Street Railway Journal for August, 1899, p. 528, describing a somewhat similar scheme as used by John I. Beggs, president and general manager of the Milwaukee Electric Railway & Light Company. Editors.





SAMPLE SHEETS FROM GENERAL MANAGER'S DATA BOOK

The writer uses a vest pocket note book with pages $5\frac{1}{4}$ ins. long by $2\frac{1}{4}$ ins. wide, quadrille ruled with 3-16-in. spaces. This shows the gross earnings and the principal items of operation, net earnings, fixed charges, surplus, per cent of earnings used in operation, etc., by months. The small book which I always carry in my pocket shows our operations in this manner for the past seven years, and has sufficient room for the next seven. It also shows a number of miscellaneous statistics by years, such as the motor and trailer mileage; the motor and trailer car-hours; number of one-way trips; operating expenses per car-mile and per car-hour; per cent of gross earnings paid in damages; earnings per car-mile and per car-hour; gross receipts per passenger, and from advertising, chartered cars, mails, freight and other earnings, together with the gross yearly expense of maintenance of way and structure, equipment, operation of power plants, car service, general expenses, taxes, sinking fund, interest on funded debt, etc., etc. I enter the various groups of items down the left-hand side of a left-hand page, and then cut away about 1 in. from the left-hand edge of a sufficient number of the following pages to accommodate the figures referring to those items for the periods I wish to cover. In this way the one entry of the names of the items will suffice for several pages of statistics, as the rows of figures on any page will match up with the proper items on the key page. I have found this plan very convenient, as it is possible to carry this book without its becoming at all burdensome.

John A. Beeler, V. Pres. and Gen. Mgr.,
Denver City Tramway Co.

B.—EMPLOYEES

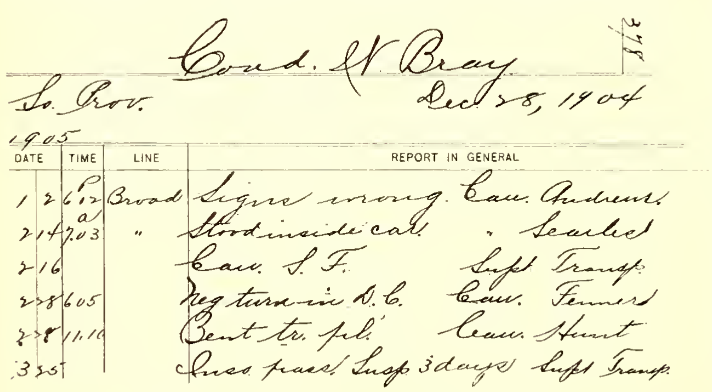
B 27.—What do you consider the best system for keeping records of individual conductors and motormen? Please describe the system you use.

In response to several inquiries for information concerning methods of keeping individual records of motormen and conductors, the following descriptions of two representative record systems have been prepared.

The Rhode Island Company, of Providence, R. I., keeps records of conductors and motormen by means of what is known as a "jacket" system, supplemented by a card index. The "jacket" used consists of a heavy manila envelope, 11½ ins. long by 8½ ins. wide, having a flap along the long edge. The envelopes and cards are filed under the conductor's or motorman's number, and thereafter referred to by this particular number.

In the jacket is kept a complete record, starting with the application blank which is turned in by the employment department as soon as the man is hired. At this time the man's agreement with the company is filed, with a signed statement that he has received a badge, rule book, book of by-laws of the benefit association, running time book, and instruction book. As soon as an applicant for the position of conductor has been turned over by an inspector to a regular conductor for instruction, a rating memorandum is made out and sent to the office of the superintendent of transportation, and is filed in the applicant's envelope. The rating memorandum is filled out for each motorman at the time he goes out to be instructed on the special instruction car.

The next record to be filed in the jacket is the instruction blank, on which each motorman or conductor who instructs a new man signifies that the applicant has been instructed and is competent to run a car, etc. This blank is signed by the division inspector in the division to which the new man has been appointed, signifying that the applicant is competent to run a car over the various lines in that division. The blank is also signed by the superintendent of



Cond. W. Bray
So. Prov. Dec 28, 1904
1905

DATE	TIME	LINE	REPORT IN GENERAL
1/2	6.12 P	Broad	Signs wrong. Cau. Andrews.
2/14	7.03 a	"	Stood inside car. , Scarlet
2/16			Cau. S. F. Supt Transp.
2/28	6.05		Reg turn in D. C. Cau. Fenner
2/28	11.10		Bent tr. pl. Cau. Hunt
3/25			Pass pass. Susp 3 days Supt Transp.

EMPLOYEES' RECORD CARD, RHODE ISLAND COMPANY

the division to which the new man has been appointed, stating that the applicant has been examined on the running time and the various rules and general orders for motormen and conductors, and has been found to have a thorough knowledge of the duties. This form is then signed by the employee himself, stating that he has read and thoroughly understands the rules and instructions in the rule book, and the general orders issued up to the time of his appointment, and the blank then goes into the envelope for record.

After this time the jacket is used for filing all letters referring to the individual employee, also complaints made by passengers, together with the inspector's or superintendent's investigation. The jacket also contains all accident reports with statements of investigations attached, showing whether or not the employee was considered responsible for the accident. All original reports of inspectors concerning the individual employees are filed in the same envelope with a slip showing what action, if any, was taken with reference to these reports.

On the card system a condensed record of all matter contained in the jacket is kept, which gives a very quick method of ascertaining a man's general record, and the original papers in the jacket are not looked up unless some particular occasion requires it. The card used in this connection is 6¼ ins. wide by 10 ins. long, and the column headings and general method of filling in the records will be understood from the accompanying sample. In filling up the cards a system of abbreviations is used to save space. For instance, "Cau. S. F." signifies "Cautioned for short fares;" "Bent. Tr. Pl." means "Bent trolley pole," etc. On these cards entries concerning missing fares are made in red ink, so that the conductor's register record can be obtained at a glance, and too many entries in red ink call for special investigations.

Motorman .... File No. .... Badge No. ....

Employed .... Assigned to ....

Discharged .... Resigned .... Reappointed ....

DATE	REPORTS	Demerit	Credit	Record	Examined

RECORD CARD FOR MOTORMEN, PUBLIC SERVICE CORPORATION

Conductor .... File No. .... Badge No. ....

Employed .... Assigned to ....

Discharged .... Resigned .... Reappointed. ....

DATE	Car No.	Direction	TIME A M	TIME P M	No. Pass.	No. Reg.	Rep. by	DATE	REPORTS	Demerit	Credit	Record	Examined

RECORD CARD FOR CONDUCTORS, PUBLIC SERVICE CORPORATION

The Public Service Corporation, of New Jersey, uses a very complete record filing system which was devised by Albert Eastman, superintendent of employment. On this road all papers and records relating to each man are kept in manila paper folders, filed in a vertical filing case. In the same folder in which are filed all the original papers is also a card 15 ins. long by 9 ins. wide, on which is entered a condensed statement of the man's record. The column headings and rules for the motormen's and conductors' cards are reproduced herewith. On the card for conductors, the register record is kept on the left-hand side, and other records on the right-hand side. The manila folders in this case are filed by consecutive numbers, and not by conductors' numbers, so it is necessary to use an index in obtaining any particular record.

There are two indexes for obtaining the filing number on the particular set of papers wanted. If the employee's badge number is known, reference is had to the badge book, which contains a record of every employees' badge in use, together with the name of the man to which it belongs, and the file number under which his papers are kept. A card index is also kept which contains the names of motormen and conductors arranged alphabetically, and this is used to obtain the file number when the man's name is known. The system includes a comprehensive set of blanks uniform in size, upon which reports are sent to the record clerk concerning accidents, violations of rules, shortages in register readings, etc. The record card for each employee is made up from these reports.

Editors.

B 28.—Do most large companies keep the employees' records on the card system or in a book?

Many companies have discarded books, and keep employees' records on some adaptation of the card system. Books are unwieldy and soon become partly filled with dead records, which tend to reduce the accessibility of the live records. The card system gives flexibility in filing and making references, takes up little space, and dead records can be kept separate from the live working material.

Editors.

TREATING TIES AT DENVER

The Denver City Tramway Company has begun the practice of treating its ties with a Texas oil produce called "Impregnole," and now has a large number of ties stacked up in its yards awaiting treatment. This impregnole is claimed to be superior to creosote in many respects, as it is not so volatile and is more impervious to moisture. Impregnole is a product in which J. N. Bruck, president of the Bruck Solidified Oil Company, of Boston, is interested. A statement of properties of impregnole, submitted by Prof. F. C. Thiele, who is associated with Mr. Bruck in this work of refining Texas mineral oils, is as follows:

Boiling point above 600 degs. F.
Specific gravity, .87 to .923 at 60 degs. F.
Amount of water, none.
Liquid at 90 degs. F.
Paraffine, Naphthene, Polyterpene } 75 per cent.

In the company's tie yard a tank of impregnole is heated and the ties are submerged in it for about five minutes. There is considerable difference in the appearance of ties which have been submerged in impregnole as compared to those similarly submerged in creosote. Creosoted ties have less heavy oil remaining on them, which would seem to substantiate the claim that water does not attack a tie thus treated as it would one treated with creosote. The cost of treatment per tie for material is also less.

ROLLING STOCK FOR CENTRAL MEXICO

Cars of the types illustrated, built by the J. G. Brill Company, have been placed on the lines of the Tranvias de Aguascalientes, Mexico. Aguascalientes, which takes it name from its hot springs, is delightfully situated in the central part of Mexico, and is a city of remarkable beauty. Fifty-five cars are operated on the 15 miles of track in and about the city, the lines reaching Buena Vista and Jesus Mana Parks.

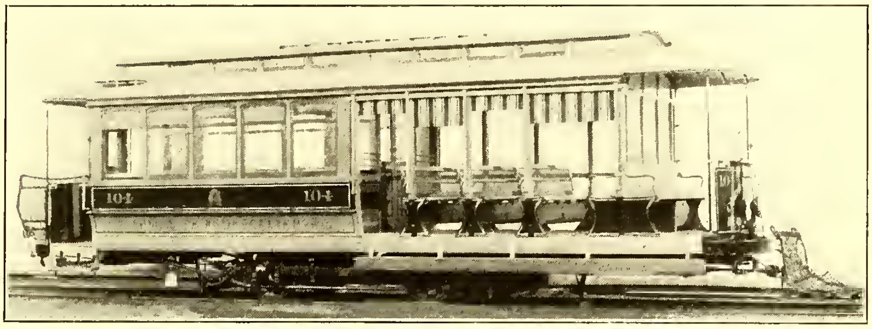
The combination open and closed type is mounted on the Brill No. 21-E trucks with 7-in. wheel base, and equipped with

STANDARD CLOSED CAR ON THE TRANVIAS DE AGUASCALIENTES

motors of 35-hp capacity. The closed compartment is furnished with spring cane upholstered seats transversely placed, and the entire seating capacity of the car is forty-five. The windows are composed of two sashes each, the lower arranged to drop into pockets in the side walls. The curtains of the open part may be drawn completely to the floor, and, together with the sashes in the bulkhead, furnish protection to this compartment. This type is largely used on the Pacific Coast and is already employed in Mexico.

The other type has the semi-convertible window system of raising the sashes into pockets in the side roofs. The length over the end panels is 20 ft. 8 ins, and the width over posts at belt is 8 ft. This type also is mounted on the Brill No. 21-E truck. The seating capacity is thirty-two. Cherry in natural color, with decorated birch ceilings, constitutes the interior finish. Among the furnishings included in the equipment are the manufacturer's angle-iron bumpers, radial draw-bars, "Dedenda" gongs, "Retriever" bells, sand boxes, folding gates and ratchet brake handles.

The dimensions of the combination type are: Length over the open compartment, 15 ft. 2¼ ins., and over the closed compartment, 13 ft. 5 ins. The length over the crown pieces is 32 ft. 7¼ ins., and from the panel over the crown piece, 4 ft.

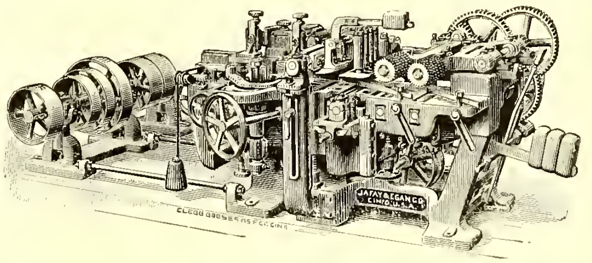


COMBINATION CAR FOR USE IN AGUASCALIENTES, MEX.

The width over the sills is 7 ft. 4 ins., and over the posts at the belt, 8 ft. 2 ins. The side sills are 3¾ ins. x 7 ins., and the sill plates are 8 ins. x ½ in. The semi-convertible type is 20 ft. 8 ins. over the end panels and 28 ft. 8 ins. over the crown pieces. From the panel over the crown piece is 4 ft. The width over the sills is 7 ft. 8½ ins., and over the posts at the belt, 8 ft. The sweep of the posts is 1¾ ins. The side sills are 5 ins. x 3⅜ ins. and the end sills are 3½ ins. x 6⅝ ins. The thickness of the corner posts is 3¾ ins., and of the side posts, 2¾ ins. The aisle is 22 ins. wide, and the seats, 35 ins. long.

FOUR-SIDED MOLDER

The accompanying illustration shows an improved molder for street railway shops, which is the result of the J. A. Fay & Egan Company's aim to bring out a molder that will answer satisfactorily the most particular requirements. The following



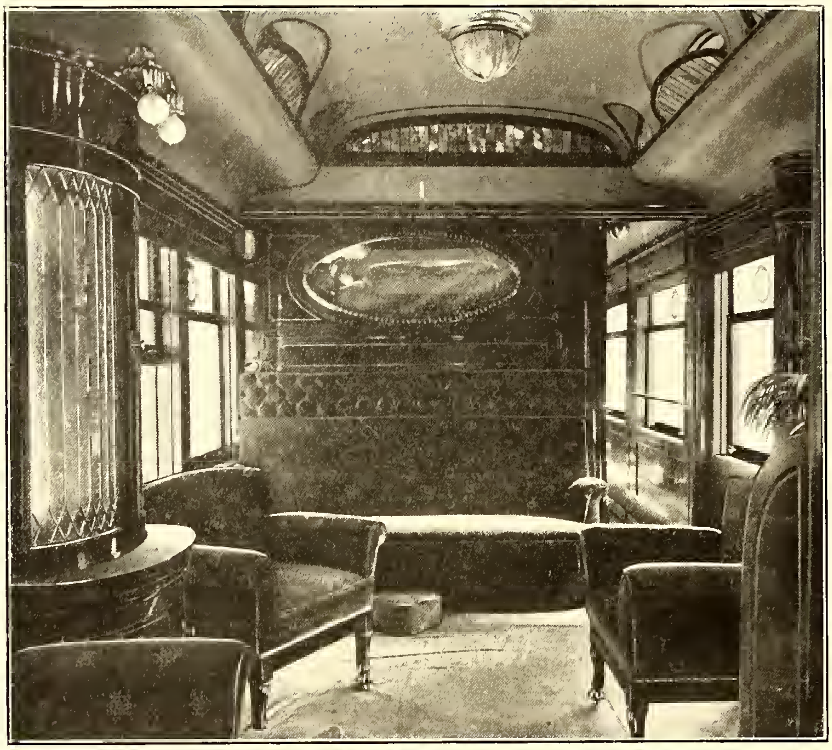
FOUR-SIDED MOLDER

points in its make-up will be sure to recommend it to those who want a strictly first-class machine for fine molding: The lower head cuts first; the table at the feeding-in end is adjustable independently; the upper feed-rolls are driven down; all pressure bars can be instantly thrown back to give access to the heads; the lower head and its bearings draw out endwise for setting the knives; the countershaft is at the feeding-out end of the machine, and there is no rubbing or cutting of belts.

The molder is made in sizes to work from 7 ins. to 10 ins. wide and to 10 ins. thick. The feed is very powerful and as fast as desired, and all the different adjustments are made easily, quickly and accurately.

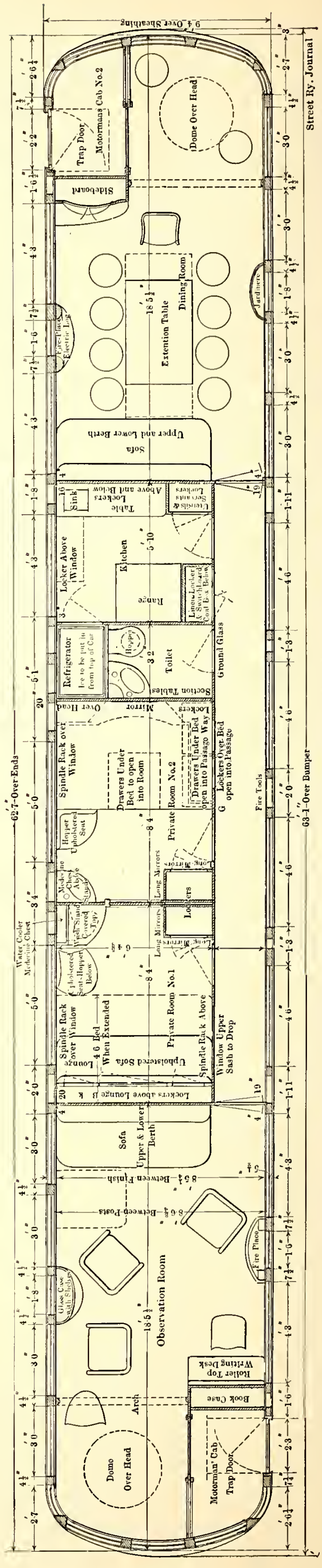
PRIVATE CAR FOR PRESIDENT HUNTINGTON

One of the features of the electrical exhibit at the International Railroad Congress, in Washington, was the private electric car "Alabama," recently built by the St. Louis Car Company for H. E. Huntington, president of the Los Angeles Railway Company, of Los Angeles, Cal. A description of the steel frame of this car was published in the STREET RAILWAY JOURNAL for Nov. 5, 1904. The car has now been finished and is



OBSERVATION COMPARTMENT, HUNTINGTON PRIVATE CAR

DINING ROOM, HUNTINGTON PRIVATE CAR



PLAN OF ELECTRIC CAR BUILT FOR H. E. HUNTINGTON, PRESIDENT OF THE LOS ANGELES RAILWAY COMPANY, SHOWING ARRANGEMENT OF VARIOUS COMPARTMENTS

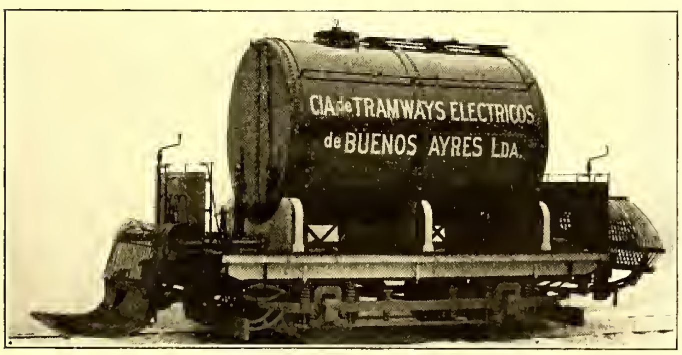
undoubtedly the most complete which has ever been built for an electric railway company. It includes bed rooms, kitchen, three toilets, dining and observation compartments, and all of the comforts which are embodied in a private car on any steam railroad. A plan of the car, showing the interior arrangement, as well as views of the dining and observation ends, are presented in the accompanying engravings.

Taking up a detailed description of the car from the dining room end, this compartment is finished like the rest of the car, in African figured mahogany, with small inlaid work and carvings for decorations. It has an extension table capable of seating ten persons, fireplace fitted with Consolidated electric car heaters, buffet, china closet, lounge which can be converted into and upper and lower berth, jardiniere, etc. The kitchen, which is the next compartment, is fitted with a coal and electric range, lockers, sink, refrigerator, dressers, etc. The kitchen is finished in quartered-sawed oak. There are two staterooms finished in Prima Vera, with double bed, lockers, washstand, running hot and cold water, etc. The observation end is fitted up very similar to the dining room, except that there is no dining table and a fireplace has been installed instead of the jardiniere.

The car can be run in either direction, and the motorman's cab is located at one side over the entrance steps, so as to give an uninterrupted view in front for observation purposes. The shades are of figured silk, with Keeler extension fixtures, made by the Federal Manufacturing Company, of Elyria, Ohio. Mason safety tread steps are used and the car is mounted on Hedley St. Louis trucks. It will be equipped with four 2000-hp Westinghouse motors, and will weigh, with equipment, 103,000 lbs.

SPRINKLING EQUIPMENT FOR BUENOS-AYRES

The Cia. de Tramways Electricos de Buenos-Ayres has recently received from the J. G. Brill Company the type of sprinkler illustrated, having a capacity of 2480 gals. Under ordinary conditions this quantity will sprinkle 4 miles to 6 miles of roadway. The cylindrical form of tank is used, as it is stronger, less expensive and the curved form of the bottom gives better pressure when the water is low. The tank is filled through the manhole at the top. The substantial cradles supporting the tank are arranged to distribute the weight over the framing to the best possible advantage. There are four sprinkling heads, two at each end, and to facilitate inspection of the valves, they are placed above the platforms. The patented sprinkling head consists of a cone



SPRINKLER CAR FOR BUENOS AYRES TRAMWAYS

adjusted in the mouth of a passage pipe by means of a stud and spider, which arrangement emits the water in a thin film, which breaks into globules that are distributed uniformly over the surface of the road. The spray may be increased or diminished by simply turning a nut on the outside of the cone. Gate valves on convenient handles control the passage of water through the passage pipes.

The sprinkler is 16 ft. over the end panels and 10 ft. over the tank. The width over outside sills is 6 ft. 10 ins. The side sills are 4¾ ins. x 10 ins., and the end sills are 7 ins x 7 ins. The steel tank is 6 ft. 6 ins. in diameter x 10 ft. long. The Brill No. 21 type of truck is used on account of its strength and easy riding qualities. The solid forged frames of the truck enable it to bear the load without sagging at the ends, and the spring arrangement prevents oscillation, a necessary consideration, since oscillation under such a weight would be fatal to the rails. The weight of the body, tank and truck is 14,400 lbs., and the weight with the tank filled is 34,400 lbs.

CONVERTIBLE CARS FOR LINCOLN, NEB.

The Lincoln (Neb.) Traction Company has recently received four convertible cars built by the American Car Company under the Brill patents. The system of raising the sashes and the flexible metal panels into pockets in the side roofs is too well known to merit further description. As the cars are to be run in only one direction, one side of the platforms is solidly paneled. The front platform has a rather unusual arrangement; the door, of the Brownell semi-accelerator type, is situated right at the step, and a diagonal partition, with a door in the center, divides the platform, giving the motorman a compartment where he is free from all interference and facilitating the movement of passengers in and out. The rear plat-

CONVERTIBLE CAR FOR THE LINCOLN TRACTION COMPANY

form is of the "Detroit" type, with the pipe rail dividing the platform and keeping the entrance clear. The seats are of spring rattan and are arranged to accommodate twenty-four persons. The interiors are handsomely finished in golden oak, with decorated ceilings. The cars are mounted on the Brill No. 21-E trucks with a wheel base of 8 ft. and 33-in. wheels. Ninety-five cars are now operated on the 55 miles of track of the Lincoln Traction Company. Lincoln has a population of 40,000.

The new cars are 20 ft. 7 ins. over the end panels and 30 ft. 7 ins. over the crown pieces. From the panel over the crown piece is 6 ft. at the rear and 4 ft. at the front. The width over the sills, including the facing, is 7 ft. 6½ ins., and over the posts at the belt, 8 ft. 4½ ins. The sweep of the posts is 5 ins. The distance between the centers of the posts is 2 ft. 7 ins. The side sills are 5⅛ ins. x 5½ ins. and 5¾ ins. x 7 ins., connected by a 5-in. Z-bar. The end sills are 4¾ ins. x 6 ins. The thickness of the corner posts is 3¾ ins., and of the side posts, 3⅜ ins. The seats are 34⅝ ins. long and the aisles are 23 ins. wide. The height of the steps is 14 ins. and of the risers, 12 ins. The specialties include angle-iron bumpers, "Dedenda" gongs, etc., of Brill make, and American Car Company sand boxes.

General Manager Robert McCulloch, of the United Railways Company, of St. Louis, has adopted a new plan to aid in improving the personnel of that company. Hereafter every motorman and conductor employed will be asked to supply a photograph of himself. If he has none the company will have one taken, but he cannot go to work until the photograph is in the hands of the company. When this is done the name and age of the new employee will be taken and the photograph and the card will be pigeon-holed together. The man's record will be kept with the photograph and his delinquencies noted.

NEW YORK STATE CONVENTION

An official circular issued by the Street Railway Association of the State of New York relative to the Lake George meeting contains, in addition to the programme announced in previous issues of the STREET RAILWAY JOURNAL, the following information:

The headquarters of the association will be at Fort William Henry Hotel, where all members are urged to procure accommodations, if possible. There are two other hotels, where delegates may be accommodated, viz., The Worden and The Carpenter.

The Trunk Line Association has agreed that all persons attending the convention and purchasing tickets from points in New York State, and obtaining a certificate to that effect, will be allowed the usual rate of one-third the regular fare for return tickets. To obtain this concession at least 100 persons must purchase tickets and have them validated at the meeting b. the secretary of this association. Tickets may be purchased not earlier than June 23. There was some misunderstanding on this point at the last convention, and but very few of those in attendance procured the necessary certificate when they bought their tickets for Utica, and hence no reduction was obtainable for the return trip.

It has been learned that the summer schedule on the Delaware & Hudson Road will not go into effect until Sunday, June 25. Those who intend coming to the convention, therefore, should be mindful of this fact in figuring on connections at Albany. Cars on the Hudson Valley Railway leave Albany every hour.

All street railways in the State of New York are eligible to membership, and it is hoped that a large number of the roads which are not now members will send delegates authorized to join the association.

The list of papers to be presented at the meeting was published in the STREET RAILWAY JOURNAL for June 3, 1905, page 1016.

The secretary is sending out a notice reminding all delegates and supply men to bring last year's convention badges with them. It will be remembered that a new plan for handling the badges was put in force at the Utica convention, and the same badges used last year are to be used this year. An extra bar will be provided for this convention, bearing the name "Lake George," which will be attached to last year's badge, so it is hoped all who attended the last convention will take their badges with them to Lake George.

This year a special feature will be made of the exhibits. The committee on exhibits made a trip to Lake George early this week and perfected all details for the handling and installing of exhibits. The casino near Fort William Henry Hotel has been secured for exhibit purposes. There will be available about 3600 sq. ft. of floor space, and a charge of 10 cents per square foot will be made by the association to exhibitors, this charge to include lighting and power if required. Arrangements have been made with a local trucking firm for hauling material from the railroad station to the casino at a reasonable charge. There will be a side track near the hotel where trucks, cars or other heavy exhibits may be shown. The committee has also made arrangements whereby exhibitors will be able to have carpenter, painting, decorating and other work done at reasonable cost. H. N. Ransom will be at the Fort William Henry Hotel a few days before the date of meeting and he will have full charge of exhibits on the grounds. Material should be consigned to the Fort William Henry Hotel, Caldwell, N. Y., in Mr. Ransom's care. Applications for space and all inquiries relative to exhibits should be addressed to B. B. Nostrand, Jr., president and general manager, Peekskill Lighting & Railroad Company, Peekskill, N. Y., who is chairman of the committee.

VARIABLE-SPEED MOTORS FOR MACHINE TOOLS

The Electro-Dynamic Company, of Bayonne, N. J., which is making a specialty of variable and constant-speed motors for machine-tool and general service, is planning to make an extensive exhibit at the coming Master Mechanics' and Master Car Builders' conventions at Manhattan Beach, New York, June 14 to 21. The exhibit will illustrate the wide possibilities of these motors. To show their wide range and ability to reverse under load, the company is planning to exhibit one of its type "5-2" four to one inter-pole variable-speed motors belted to a generator. This motor will be reversed under all of the above conditions of load and speed, and in a variety of ways will show results which, it is claimed, have never been obtained heretofore in the operation of electric motors, either for constant or variable-speed work. The company will also have on exhibition different sizes of motors running from 1 hp at a speed ratio of four to one up to 10 hp at a speed ratio of four to one.

The motors to be exhibited at Manhattan Beach will cover 123 distinct varieties, which will enable a user of motors to have an opportunity for choice which has never heretofore been equaled. In addition to its exhibit, one of the company's "5-2" variable-speed motors, having a speed ratio of four to one, will operate the electric car lighting equipment of the Consolidated Railway, Electric Lighting & Equipment Company.

The Electro-Dynamic Company is rapidly enlarging its scope of operation for the inter-pole motor, and within the next ninety days will be prepared to sell at least 200 varieties of constant and variable-speed motors running up as high as 150 hp.

PARK BUSINESS FROM TORONTO

The Toronto & York Radial Railway, of Toronto, Ont., says that last summer when banners were placed upon the Toronto Railway cars containing simply the two words "Bond Lake," a great deal of curiosity was excited among the citizens of Toronto as to what these words meant. The conductors were deluged with questions. The consensus of opinion appeared to be that a new form of patent medicine was being advertised. The lack of information on the part of the citizens of Toronto as to Bond Lake was surprising to the management of the company. There are thousands of people in Toronto who do not know that 17 miles to the north of the city lies a park comprising about 200 acres prettily situated on rising ground. In elevation the park is 720 ft. above the level of Lake Ontario, and, by reason of its elevation, even in the sultriest days of summer, is always cool. The beautiful little lake within the park is adapted to boating. The waters are cool and clear and sheltered from storm on every side by hills and trees. The park is well wooded with cedar, spruce, maple and pine and forms a splendidly shaded promenade. There are play grounds, swings, boats, rain shelters, a pavilion and everything that makes up the ideal pleasure resort.

General Manager Walter L. Adams and Superintendent Daniel J. Kane, of the Milford & Uxbridge Street Railway, officiated as floor marshal and assistant at the annual dance of the employees of their road at the opening of Nipmuc Park, Mendon, recently. Each year the company opens its park just previous to Memorial Day with a dance for the employees, and the participation by the officers of the road indicates the cordial relations existing with the employees. The company owns a well-developed and well-patronized amusement property at Nipmuc Lake.

FINANCIAL INTELLIGENCE

WALL STREET, June 7, 1905.

The Money Market

Despite the heavy loss in cash sustained by the banks last week, which resulted in a decrease of nearly $5,500,000 in surplus reserve, and the temporary withdrawal of considerable amounts of funds from the market by some of the larger banks, the money market experienced no material change during the past week. The tone was extremely easy throughout, and rates for all maturities ruled practically the same as those heretofore prevailing. Early in the week there was considerable calling and shifting of loans, which resulted in a temporary advance in the call loan rate to 4 per cent, but thereafter borrowers found no difficulty in securing all necessary accommodations at 2¼ and 2½ per cent. In the time loan department the volume of business showed a still further falling off. The banks continued to offer with moderate freedom, but the inquiry, both from stock commission houses and mercantile sources, was practically at a standstill. For sixty and ninety days' contracts 3 per cent was quoted, while money for four and five months was in abundant supply at 3¼ per cent. Six months funds were attainable in almost any quantity, at 3½ per cent, while over the year maturities were freely offered at 3¾ per cent. Some transactions at 3¾ per cent for eight months were reported on all industrial collateral. Mercantile paper was in excellent demand. The supply, however, was extremely light, indicating that collections throughout the country are prompt, and making it unnecessary for merchants to borrow in the open market. Prime endorsed bills were discounted at 3½ per cent. Choice single-named were quoted at 3¾ and 4 per cent, while other grades ranged from 4½ to 5 per cent. Sterling exchanges remain steady, around $4.87 for prime demand bills, which is considerably below the gold export point. The money markets abroad have remained comparatively easy. Discounts at London were quoted at the close at 2 1-16 per cent; at Berlin the rate was 2⅛ per cent, and at Paris 1⅜ per cent. The bank statement published last Saturday showed a further contraction in loans of $9,720,300, which was probably due to continued liquidation in stocks. Cash decreased $10,078,400. Deposits decreased $18,651,500, and the surplus reserve decreased $5,415,525 to $6,050,275, as against $31,760,675 in the corresponding week of 1904, $4,775,650 in 1903, $11,285,575 in 1902, $13,341,500 in 1901, and $18,374,250 in 1900. At the close there was nothing in the situation to warrant the belief that higher interest changes will prevail in the near future. On July 1, the banks will be called upon to meet the usually heavy interest and dividend payments, as well as the return of the remaining 25 per cent of Government deposits due under the recent call of the Secretary of the Treasury. It is expected that considerable shifting of accounts will result from these payments, but that the advance in rates, if any, will be checked by liberal offerings of foreign money in the local market.

The Stock Market

There was a further reduction in the volume of business on the Stock Exchange this week, and although more or less irregularity developed at times, the general tone of the market was firm. The opening was strong and substantially higher, but this was followed by renewed liquidation and profusive short selling, which resulted in the loss of all of the early improvements. Later, however, the market recovered sharply. The Government cotton report was much better than was generally expected, and while it caused a sharp break in the price of cotton, it materially helped the stock market. There was also evidence that stocks were being absorbed by the larger interests. The flurry in the call loan rate to 4 per cent, and the heavy decrease in the surplus reserve of the banks had little or no effect upon values. At the beginning of the present week the upward movement was resumed. Reports from the Western traffic managers were very encouraging. Railway gross earnings were highly favorable, which, together with the extreme ease in the money market, imparted a decidedly better feeling. Toward the close, however, the market developed weakness, prices declining sharply under the lead of Amalgamated Copper and the steel stocks. The bond market was fairly active, but irregular, in sympathy with the price movements in the stock market.

The local traction issues developed pronounced strength in the early dealings, but at the close prices ran off sharply in sympathy with the weakness in other quarters of the market.

Philadelphia

The market for the local traction issues was practically demoralized during the past week. Dealings in all of the speculative issues were upon a much larger scale, and were accompanied by sharp declines in values. United Gas & Improvement led the downward movement, the price falling from 104¼ to 104½, at the opening, to 90, and closing at 91½, on the exchange of about 70,000 shares of stock. Philadelphia Rapid Transit was also under pressure, the price yielding sharply, owing to the agitation of a 3-cent fare and to the reported determination of the city administration to have repealed the recent ordinances giving the company franchises on about 150 miles of street. In the early dealings the stock held firm at 31, but subsequently on heavy dealings the price ran off to 25⅛, but rallied at the close to 27: Upwards of 30,000 shares changed hands. Philadelphia Traction lost a point to 99 on comparatively small transactions. Union Traction developed unusual activity, but suffered severely in sympathy with the price movements in the other issues. Opening at 63, there was a decline to 58½, the closing transaction taking place at 59⅛. About 9000 shares were traded in. Philadelphia Company common ran off from 43⅝ to 42, and closed at the lowest; while the preferred brought 47½ for an odd lot. Other transactions included United Companies of New Jersey at 27½, American Railways at 51¼ to 50⅛, Consolidated Traction of New Jersey at 83, and Fairmount Park Transportation at 20.

Chicago

The street railway issues were practically neglected. Trading in them was confined to very small amounts, but values in most instances displayed strength. The feature of the week's trading was the sharp advance in Metropolitan Elevated common and preferred, the former rising a point to 24½, on purchases of about 220 shares, while the preferred advanced from 62 to 65 on the exchange of less than 400 shares. There was no news to explain the pronounced strength displayed by these issues. South Side Elevated broke from 93 to 91½, on sales aggregating 217 shares. Other transactions included Chicago & Oak Park Elevated at 20, North Chicago Street Railway at 60, Northwestern Elevated common at 22 to 22½.

Other Traction Securities

In the Baltimore market trading was rather brisk, and prices generally showed a firmer tendency. Interest centered largely in the United Railway issues, all of which were considerably more animated and firm. The stock sold at from 14½ down to 14, and back to 14¼ for about 1500 shares. The 4 per cent bonds fluctuated between 92⅜ and 92¾, closing at the highest, while the incomes moved up from 59 to 61. Over $25,000 of the 4s and about $95,000 of the incomes were dealt in. The advance in these issues was due to reports of a plan to refinance the company, and also that negotiations were pending for the sale of the majority interest in the stock which is pooled with the committee. There was no confirmation of these reports. Other transactions included 413 shares Norfolk Railway & Light stock at 13, $4,000 5s at 91½, $56,000 City Passenger Railway 5s at 106¼, Richmond Traction 5s at 106¾, Augusta Railway & Electric 5s at 103½, $2,000 Washington City & Suburban Railway 5s at 106¼, $7,000 Macon Railway & Light 5s at 99. The Boston market was extremely quiet and absolutely without feature. Boston Elevated lost ¾ early in the week, but subsequently there was a full recovery to 157. Massachusetts Electric common sold at 16½ and 17 for small lots, and the preferred brought 59. Boston & Suburban preferred sold at 67½ for one share, and ten Boston & Worcester brought 30. West End sold from 96½ to 97, and the preferred changed hands at from 117 to 116. In the New York curb market, Interborough Rapid Transit continued to fluctuate rather sharply on limited trading. From 203 at the opening the price ran off to 198⅜, but at the close there was an advance to 205 on the declaration of a quarterly dividend of 2 per cent. This is an increase of ¼ per cent over the previous payments, and places the stock upon an 8 per cent basis. About 6000 shares were traded in. New Orleans Railway issues, when issued, were quiet but firm, 600 shares of the common changing hands at 37⅛ to 37½, while about 800 shares of the preferred brought 78¼ to 78. The bonds were dealt in to the extent of $18,000, at from 91 to 90¼. An odd lot of American Light & Traction common sold at 87½, and a small lot of the preferred brought 101½.

Very little activity in Cincinnati traction list. Detroit United made a slight gain from 89¼ to 90, a new high mark, caused by improved prospects of increased dividends. Toledo Railway & Light sold at 33¾, Cincinnati Street Railway at 148¼, Cincinnati, Newport & Covington common at 32, and Cincinnati & Hamilton at 60, all small transactions.

At Cleveland nearly everything except Detroit United showed fractional declines, and there was little activity. Northern Ohio Cleveland & Southern common at 9½ and preferred at 54½, Traction went off to 22 and 22¼, Aurora, Elgin & Chicago at 15⅞, and Northern Texas Traction at 58. Aurora, Elgin & Chicago bonds sold at 90, a slight decline, as a result of the opening of the pool referred to in another column of this issue. Miami & Erie Canal bonds went begging at 8, Northern Ohio Traction 4s sold at 70¼, a new high mark; Cleveland Electric sold at 79.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	May 31	June 7
American Railways	52	50
Boston Elevated	156¼	156¾
Brooklyn Rapid Transit	62¼	62¾
Chicago City	—	—
Chicago Union Traction (common)	6¼	6
Chicago Union Traction (preferred)	34	30
Cleveland Electric	—	—
Consolidated Traction of New Jersey	83	83
Consolidated Traction of New Jersey 5s	109	109
Detroit United	90⅛	89½
Interborough Rapid Transit	201	201½
International Traction of Buffalo	—	25
International Traction of Buffalo (preferred)	—	60
International Traction of Buffalo 4s	—	82½
Manhattan Railway	162	163
Massachusetts Electric Cos. (common)	16	16
Massachusetts Electric Cos. (preferred)	59	58½
Metropolitan Elevated, Chicago (common)	22	23
Metropolitan Elevated, Chicago (preferred)	62	64½
Metropolitan Street	117⅝	118⅞
Metropolitan Securities	77⅞	77⅝
New Orleans Railways (common), W. I	35½	37
New Orleans Railways (preferred), W. I	77	77
New Orleans Railways 4½s	90½	90⅛
North American	99¼	98
North Jersey Street Railway	—	—
Philadelphia Company (common)	43⅝	42
Philadelphia Rapid Transit	30	27⅛
Philadelphia Traction	100⅛	99¾
Public Service Corporation 5 per cent notes	97	97
Public Service Corporation certificates	70	69½
South Side Elevated (Chicago)	—	—
Third Avenue	127	126
Twin City, Minneapolis (common)	111½	110¾
Union Traction (Philadelphia)	63	60½
West End (common)	—	96¾
West End (preferred)	—	116

a Asked. W. I., when issued.

Iron and Steel

The "Iron Age" says the week has been a very uneventful one in nearly all directions. What is almost a deadlock between buyers and sellers of pig-iron continues, the only fair degree of activity being in the Chicago district. The Birmingham market is weaker, in spite of the fact that there is some uneasiness over the possibility of trouble with the coal miners. The absence of a demand for pig-iron by the large steel companies is causing pressure on the market. The market for steel is easier, and some interests who have had little to offer in the past are now hunting for business. A moderate amount of additional tonnage has come up in plates and shapes. Shading of prices is becoming more general in the lighter lines. Export sales are being more actively pushed in all directions.

CLEVELAND & SHARON REORGANIZED

The Cleveland & Sharon Traction Company, which has been in the hands of a receiver for the past year, and which has done considerable grading on a line from Middlefield, Ohio, to Sharon, Pa., has been reorganized. It is announced that Philadelphia and New York people have bought the controlling interest in the proposition, and that the securities will be taken by the banking firms of E. C. Miller & Company and Mellor & Company, of Philadelphia. The Fidelity Trust Company, of Philadelphia, is trustee for a new bond issue of $1,500,000. The Eastern Construction Company, of Cleveland, of which Francis G. Morgan is president, has the contract for completing the road, and a contract for grading has been placed with Joyce & Fawcett, of Youngstown. The Warren, Cortland & Jefferson Railway, which was projected as a north and south road by the same interests, will be built later. The stretch between Middlefield and Mesopotamia will be completed as soon as possible, and a gasoline motor car will be tested on this piece. If the car is found successful it is quite probable that the balance of the system will be similarly equipped.

NEW YORK CITY RAILWAY EARNINGS FOR THE QUARTER

The New York City Railway Company, operating the surface lines in New York City, reports earnings as follows for the quarter ended March 31:

	1905.	1904.
Gross receipts	$3,639,467	$3,868,019
Operating expenses	2,467,374	2,380,110
Net earnings	$1,172,093	$1,487,909
Other income	282,571	393,379
Total income	$1,454,664	$1,881,288
Fixed charges	2,777,070	2,647,839
Deficit	$1,322,406	$766,551

THAT IOWA CONSOLIDATION

It develops that the Chicago Great Western Railway Company is interested in the consolidation of the Waterloo, Cedar Falls & Northern and the Mason City & Clear Lake Traction Companies, and the construction of the 50-mile connecting link, mentioned in the STREET RAILWAY JOURNAL a few weeks ago. It has been rumored for several days that L. S. Cass, president of the Waterloo, Cedar Falls & Northern Railway, had finally completed arrangements for financing the consolidation and the construction of connecting and other lines, and it now seems that the financial part of the enterprise is to be taken care of by the Chicago Great Western Railroad. L. S. Cass, while still holding the presidency of the Waterloo Company, has recently assumed the duties of assistant to A. B. Stickney, president of the Great Western, with headquarters at St. Paul. On June 1 the Mason City & Fort Dodge Railway Company, under which name the Great Western constructed and operates the Fort Dodge-Omaha extension, and also several other lines within the State of Iowa, filed an amendment to its articles of incorporation with the Secretary of State of Iowa, increasing the capital stock from $20,000,000 to $34,000,000. While the said amendment does not disclose its purpose, it is generally understood in Iowa that the purpose of the company is to take over the property of the two interurban lines, build the connecting link, and operate all as a part of the Iowa system of the Great Western. It is also stated that a part of the increase in capital will be used to build other extensions in Iowa. One such extension under consideration is from Arispe, a point on the Kansas City division in Southern Iowa, to Carroll, on the Fort Dodge-Omaha line of the Great Western. Electricity will no doubt be used as motive power on the Waterloo, Cedar Falls & Mason City interurban lines for the carrying of passengers, but steam power will be used for freight traffic.

MICHIGAN CENTRAL ELECTRIFICATION STORY

The statement is made by the "Detroit Free Press" that the work of developing power along the Huron River and the lake region north of Dexter, Mich., is being done in the interest of the Michigan Central Railroad. It is proposed by the Michigan Central, says the "Press," to build a monster dam across the Huron River at a little hamlet called Hudson, between Dexter and the string of lakes. Here a huge power house will be erected, and power furnished to the Michigan Central for operating its trains both east and west of Ypsilanti. The dam which it is proposed to build will raise the level of the string of lakes, which includes Zukey, Strawberry Devil's Basin, Great and Little Whitewood, Portage and Base, 4 ft. 2 ins., and in doing this the surface of Portage Lake will be doubled, and by this means considerable ground, now in possession of the cottagers, inundated. The options on this land have not yet been secured, and the road has been holding back the knowledge of its connection until the deal was completed. The Portage Lake people had contemplated building a canal to drain some of the marsh land about the lake and connect the lake with Base Lake. Since the rumor of the building of the dam they have held back from beginning operations, as this land will be put entirely under water by the new arrangement.

NO ACTION AS TO THIRD TRACK ON NEW YORK "L"

After an exhaustive hearing on the plan of the Interborough Rapid Transit Company to three-track the Second and Third Avenue Elevated Railroad lines, so as to install a better express service between City Hall and the Bronx, the Rapid Transit Commission has voted to postpone action on the entire matter until after the opening of the Lenox Avenue branch of the subway, on or about July 1. The Commissioners wish to judge whether or not the opening of this subway connection will relieve the present elevated congestion.

MR. MORTON AND NEW YORK SUBWAY DEVELOPMENTS

Brief mention was made in the last issue of the Street Railway Journal of the selection by Metropolitan Street Railway interests in New York of Paul Morton, who is to retire as Secretary of the Navy on July 1, as their official representative in active charge of the plans of the syndicate for building the new subway lines for which awards are to be made in the fall. It seems that, as previously stated, a separate company will be organized to carry out this work, of which Mr. Morton will be the head. Conflicting reports there are, of course, concerning a step so pretentious as this. Two official statements, one issued by John B. McDonald, who became connected with the Metropolitan Company after building the present underground lines in New York, and the other from company sources without a sponsor, have been issued. That given out by Mr. McDonald follows:

The new company will be independent of all other companies of the city. It will build the new subways, if it gets the contracts, entirely on its own account, and will afterward run them. Paul Morton has been chosen to be the president of the company because he is about the best and most experienced operator of railroads in the country. I will be the contractor, and will figure on the estimates for the proposed subways. S. L. F. Deyo, the engineer who was with me on the subway, will be with me in the new concern.

I do not know anything about the rumor that we will have a capital of $150,000,000. The rumor that we are fathered by the Metropolitan Street Railway Company or that we are the Metropolitan Securities Company reorganized is untrue. The only connection that we will have with the Metropolitan Street Railway Company is that we will have a system of transfers in connection with it. Otherwise we are simply the competitor of all other companies interested in the same line of work as ourselves.

The other statement says:

The selection of Paul Morton, now Secretary of the Navy, to take charge of the plans of the new subways for the Metropolitan Traction interests was decided upon at a conference in this city a few weeks ago. He will be closely associated with Thomas F. Ryan in his various enterprises, whether traction, railroad, mining, banking or other, and will lend all of his energies to this work.

Here in New York and in the first instance Mr. Morton is to have charge of the executive functions in connection with Mr. Ryan's proposals to the Rapid Transit Commission. As is well known, he is seeking the contracts for additional subways, and Mr. Morton will represent him on the executive side. John B. McDonald will have full charge of the engineering features of the work.

Mr. Morton will thus be connected with the interests which are preparing to bid for new subway lines. The fact that he comes to New York in this interest following upon the enlistment on the same side of Mr. McDonald, the constructor of the existing subways, and of S. L. F. Deyo, chief engineer of the Rapid Transit Company, shows the determined efforts now under way by the Ryan interests to secure the contracts for the new subways.

If the project which comes before the Rapid Transit Commission on Thursday to third track the Second Avenue and Third Avenue elevated lines is rejected, then the Metropolitan interests will urge the Commission to invite bids for a comprehensive system of East Side subways and put them under immediate construction. If the project for additional elevated railroad lines should succeed, the problem will become somewhat more complicated, because it is believed that the new elevated structure would discourage these subway projects.

It will be the first purpose of the new combination to convince the public that a broad view should be taken of the transit requirements of New York, and that the future growth of the city be kept always in mind and provided for. It will renew the offer made by Mr. Ryan early in 1904 to give free transfers from new subway routes to and from all its surface lines controlled by the Metropolitan Street Railway and its allied companies. This will mean a single fare to and from home for the working population of New York. It is expected that Secretary Morton will be in New York several times before leaving the Cabinet on July 1.

In connection with these statements it is interesting to note that George Gibbs, whose appointment to important positions with the Pennsylvania and Long Island Companies is mentioned elsewhere in this issue, has become consulting engineer of the Metropolitan Company, and that S. L. F. Deyo, who was chief engineer for the Subway Construction Company, which built the present subway lines, also has become a member of the Metropolitan staff.

RULING AS TO FREIGHT ON TROLLEY ROADS IN MASSACHUSETTS

The Railroad Commissioners of Massachusetts have issued a general order dealing with the law permitting street railway companies to carry freight, based upon petitions of the Taunton & Pawtucket, the Taunton & Buzzard's Bay, and the Western Massachusetts Street Railway Companies, for authority to act as common carriers under the provisions of the common law. The order is as follows:

Under chapter 202, acts of 1903, as amended by chapter 441, acts of 1904, the Legislature has established a policy of permitting street railway companies to carry freight, replacing with a general law the course of special legislation which in the past has conferred vague rights of this kind upon particular companies. In furnishing additional facilities for the transportation of merchandise, supplies and farm produce, these railways can unquestionably confer a boon upon people in sections of the State where railroad accommodation is limited or not provided at all. Several companies seeking to avail themselves of this statute have filed petitions asking unrestricted authority to carry freight of every kind coupled with the right to refuse to perform this service upon any occasion when in the judgment of the management it is deemed undesirable.

It is hardly conceivable that the Legislature intended in this way to give companies all the privileges of common carriers with the power to throw off the attendant burdens whenever so disposed, or to give them such abundant opportunity for the practice of discrimination. The statute provides that the company may engage in the business of common carrier only "in such of the cases upon such of the parts of its railway, and to such an extent" sanctioned by the local board, "as the Board of Railroad Commissioners shall certify that public necessity and convenience require." This plainly contemplates supervision over the character of the freight to be carried and the manner in which it is to be carried.

Passenger traffic upon the street railway is of paramount importance and freight business more or less incidental. The transportation of certain kinds of freight upon street cars through busy streets at any and all hours of the day would be a serious interference with other uses and enjoyment of public ways. Some articles ought never to be carried on these railways. In our opinion companies should be limited to the transportation of such goods in such manner as shall from time to time be described in schedules and statements filed in this office. In accordance with this view, the Board will require each petitioner to file a reasonably definite general description of the kinds of freight which it desires to carry, and of the manner in which it proposes to conduct the business.

AFFAIRS IN CHICAGO

James Dalrymple, manager of Glasgow's municipal street railway system, is in Chicago. As noted in the Street Railway Journal last week, he arrived in New York on Saturday, May 27, and after being the guest of honor at a banquet given by the Municipal Ownership League of New York, on the evening of that day he started for Chicago, where he arrived at 9:45 o'clock on May 29. He was met by Mayor Dunne and a committee and was entertained at luncheon. Evading the newspaper men was an experience new to him, but he managed to keep out of their toils that day, while he played golf, took a look at things in general, and attended the theater. Since then he has been in conference daily with the Mayor at the City Hall, and has voiced his theories through the daily press. He has, however, so far carefully refrained from expressing an opinion as to the best plan for Chicago to pursue, and says he will not go publicly on record until he has had time fully to study local conditions. Mr. Dalrymple was a member of a party that went to Cleveland from Chicago on June 3. While in that city he made a long speech at the request of Mayor Johnson, in which he stated emphatically that municipal ownership in this country can succeed only when all partisan issues shall have been put aside. On June 6 Mr. Dalrymple inspected the lines of the Twin City Rapid Transit Company. He is quoted as having stated that it is the finest example of street railway practice in the world.

While in Minneapolis, Mr. Dalrymple reiterated the statements made in his speech at Cleveland a few days before. In the telegraphic reports to the East of his speech in Minneapolis, Mr. Dalrymple is quoted as stating that existing conditions in this country are so vastly different from those in his Scottish city, that he is not prepared to make a statement to the effect that municipal ownership can be made a success in America. The New York "Sun" quotes Mr. Dalrymple as saying that in politics lies the germ which eventually will kill municipal ownership in this country.

Judge Grosscup, on June 2, refused to continue in force the temporary injunctions to prevent Mayor Dunne and the City Council from proceeding with municipal control pending a decision from the United States Supreme Court. The judge's refusal leaves the city administration free to give notice to oust the traction companies from streets on which the life of their franchises is questionable.

COMBINED TROLLEY AND STEAM ON NEW HAVEN—ABANDONMENT OF BRISTOL THIRD RAIL

It is announced in Hartford that the New York, New Haven & Hartford Railroad proposes to experiment on its lines between that city and Rockville with the operation over the same tracks of both steam trains and electric cars. Trolley wires will be stretched over the railroad tracks between Rockville and Vernon, and over each track of the double-tracked main line between Vernon station and some point in East Hartford, there to connect with the Hartford Street Railway, over whose lines the cars will run continuously into Hartford. The cars for almost all the way will run on the steam railroad bed at high speed. It is estimated that the time between Rockville and Hartford City Hall will be 40 minutes. By the present line it is 1 hour and 22 minutes.

The threatened abandonment of the third-rail system between Hartford, New Britain, Bristol and other towns in Hartford county by the New York, New Haven & Hartford has aroused protests as stated in the STREET RAILWAY JOURNAL some months ago. In the early weeks of the present session of the general assembly a bill was introduced requiring the company further to protect the third rail. When the bill was called for a hearing, President Mellen, who was present, replied that the company had been determined to remove the rail before July 1, when there would be no need for the proposed legislation. The company has always claimed that life was sufficiently protected, so far as the road is concerned, if the public would itself exercise ordinary care in keeping off company property; that since the disposition was to do otherwise and in addition to hold the company legally responsible for the carelessness and recklessness of individuals, it had concluded to solve the problem by removing the cause of danger. Now that the time has arrived for carrying into execution the radical plan forced upon the company by the public, a protest is raised against the action. It is said that dummy engines and coaches will be substituted for the electric cars on the line.

ANNUAL MEETING OF THE ASSOCIATION OF TRAMWAY & LIGHT RAILWAY OFFICIALS

The ninth annual meeting of the Association of Tramway & Light Railway Officials, of Great Britain, was held at the Grand Hotel, Bristol, on May 3. The association was welcomed to Bristol by Charles Challenger, traffic manager of the Bristol Tramways & Carriage Company, who referred to the pioneer work of that company, which was the first horse tramway and the first overhead trolley road in the country. The company was also the first to shorten the hours of labor of tramway employees over those enforced in horse-car days, as well as the first to establish fixed stopping stations and a pension fund for employees.

An interesting paper on the Bristol tramways was read by Sidney E. Smith, assistant traffic manager of the company, who gave a thorough description of the system mentioned.

FRAUD IN TRANSFER TICKETS

The Public Service Corporation of New Jersey has just unearthed a somewhat formidable scheme in which some of its employees have been taking part to defraud the company by manipulating transfers. The company has been aware for some time that certain conductors were exchanging transfers with each other, and that these unissued transfers were being turned in in lieu of cash, but the management decided to let the practice continue a short time, in order to make certain of detecting the go-betweens and the ringleaders. Last week the evidence in possession of the company seemed to justify energetic action, and as a result a number of conductors have confessed, and the names of all guilty employees and go-betweens are now known to the company. Whether or not arrests will follow has not been decided.

On the Public Service system it is the practice to register transfers the same as cash receipts, and the frauds have been carried on by means of a simple scheme whereby conductors would punch a certain number of transfers and turn these over to a go-between, who would distribute them to other conductors in such a way that the tickets could be turned in after certain runs in place of an equal number of cash fares. The cash so withheld was then divided up among those taking part in the fraud. The graft was detected as a result of secret service reports. As a means of preventing this manipulations of transfers in the future, it is stated the Public Service Corporation is contemplating putting two registers in each car, one for recording fares and one for transfers.

AN IMPORTANT DECISION ANTICIPATED

The Indiana Supreme Court is expected to decide, at its June session, the famous anti-interurban case in which traction companies all over the State are interested. The suit was brought by residents of College Avenue, Indianapolis, against the Union Traction Company to determine whether or not an interurban railway is the same as a steam railroad, and should buy its right of way in any city instead of using the public streets. The contention of the College Avenue property owners is that their property is damaged, because the big, heavy cars, thundering along the avenue, jar the houses so violently that their value is lessened to tenants. With the recent opening of College Avenue bridge the Broad Ripple and the Indianapolis & Northern lines were added to those using the avenue. To the contention that general damage has been worked to the property is now added the plea that the street is unsafe for pedestrians, owing to the number of cars in use. In any event it seems likely that the case will be carried to the United States Supreme Court. The residents seem to be determined, and the companies certainly cannot accept as final the decision of the State Supreme Court, should the finding of that body be adverse to their interests.

PLANS FOR TRANSMITTING NIAGARA POWER TO VANDERBILT TROLLEY LINES

President Horace E. Andrews, of the Syracuse Rapid Transit Railway and the Utica & Mohawk Valley Railroad, has announced that Niagara power will be used for the Syracuse system within a year. The transmission line will be constructed on the West Shore Railroad right of way, and the power will be developed by the Ontario Power Company. General Manager E. G. Connette, of the Syracuse Rapid Transit Company, says that the present power house of the company at Syracuse will be retained as an auxiliary power plant and also as a transforming and distributing station. The Vanderbilts will not need special legislation, it is said, to enable them to construct the transmission line across the State, such as is desired by some power companies which require the right of condemnation in order to carry out their plans.

WESTCHESTER COMPANY BREAKS GROUND—PORTCHESTER COMPANY MAKES ALLIANCE WITH NEW YORK SUBWAY LINES

The New York, Westchester & Boston Railroad Company, which plans to build a four-track third-rail line from New York to Portchester, started work Saturday, June 3, on the first division of its road at three different places. This division takes in the entire section of the Westchester Road up to the city limits. One gang began on the heavy cut between East Chester Hill and Saw Mill Lane. Another was engaged at a point between Bronxdale Avenue and White Plains Road. A third force started in between Saw Mill Lane and Pelham Parkway. This section of the work is under the direct supervision of E. V. Maitland, the resident engineer for the Westchester Company in the Borough of the Bronx. Chief Engineer William A. Pratt says he expects to have upwards of 5000 men at work by the end of this month. In an official statement the company says that "the Westchester and Belmont Interborough lines (meaning the New York subway) are so closely allied that a joint terminal will be erected to take care of traffic from one road to the other, and ultimately through traffic will exist from Bronx and Westchester stations, via subway and elevated, to the Battery."

Meanwhile, the New York & Portchester Company, the rival of the New York & Westchester, has announced that it has entered into a contract with the subway lines in New York for a connection and the interchange of traffic. The company states officially that the Interborough Company, operating the subway, will provide a physical connection between the Portchester lines and the viaduct of the Rapid Transit road, at or near 177th Street and Boston Road; and also between the line and the viaduct section of the Rapid Transit Railroad at the intersection of Southern Boulevard and Westchester Avenue; the connection to be made so as to receive and convey cars to the nearest station platform of the Interborough line. Thence the Interborough Company will convey passengers from these points over its line for the single fare of 5 cents a passenger, for one continuous ride over all of its elevated and subway lines now existing or to be built in the Boroughs of the Bronx, Manhattan and Brooklyn. The Interborough Company also says it will procure an agreement between the New York & Portchester Company and the New York City Interborough Railway Company, now constructing surface lines in the Bronx, for the transportation of passengers over its lines.

MEETING OF THE CANADIAN ASSOCIATION

Representatives from Toronto, Montreal, Ottawa, Hamilton, Quebec and other leading Canadian cities were present on June 2 at the meeting in the King Edward, Toronto, of the Canadian Street Railway Association. W. G. Ross, managing director of the Montreal company, and president of the association, presided. After luncheon the party went to the races in the private car of William Mackenzie, and in the evening were entertained at dinner by the Toronto Railway Company. A general discussion on the value and efficiency of the various forms of fenders, wheel guards, trolley guards, brakes and forms of applianees tending to reduce the severity of injuries received, was entered into. John McArthur, Toronto, read a paper on "Parks and Park Amusements, With Relation to Street Railway Receipts." E. F. Seixas, St. Catharines, discussed freight and freight collections, and J. E. Hutchinson, of the Ottawa Electric Railway Company, read a paper on discipline in the car service. The meeting continued on June 3. At that session there was a general discussion of the question of freight handling, and of the adoption of a punch for use in connection with the handling of interurban tickets. The election of officers closed the convention. W. G. Ross, Montreal, was re-elected president, and the other officers were re-elected as follows: W. H. Moore, Toronto, vice-president; C. E. A. Carr, London; D. McDonald, Montreal, and E. A. Evans, Quebec, executive committee; Allan Royce, secretary-treasurer.

NEW YORK COMPANIES REFUSE TO PAY FRANCHISE TAX

At a conference held in the Comptroller's office in New York on Saturday, counsel for the Metropolitan Street Railway Company, the Brooklyn Heights Railroad Company and for the Coney Island & Brooklyn Railroad Company gave notice that unless all they have paid for car licenses, percentages of receipt, tolls, etc., is deducted from the franchise tax recently declared valid by the United States Supreme Court, they will begin the fight over again in the eourts. Their contention, in brief, is that the State has no right to levy taxes in addition to those demanded by the cities in which the companies operate, and that if the tax is to be paid to the State, then deduction must be made of the levy placed on the companies by the eity.

NEW YORK ORDERS MORE ELECTRIC HEATERS

The New York City Railway Company has placed an order with the Consolidated Car Heating Company for complete electric heating equipments for the seventy-five new cars recently ordered from the J. G. Brill Company. Each car will have sixteen panel heaters. The connecting wires are carried in metal conduits which extend into the heater cases. The heaters are made so that all connections are inside of the case. The wiring of the car will be in aecordance with the underwriters' rules. The switches to be furnished will be the new double-quick break knife switch brought out by the Consolidated Company, and furnished on the recent orders placed by the New York City Railway Company. The switches will be enclosed in a box fitted with lock and key, so that the regulation of heat will be under the control of one man at each car house, directed to look after this matter. It is interesting to note that the heater equipment for each car is just double the numbers of heaters that it was customary up to a few years ago to place in the cars. It is believed that by having sixteen heaters instead of eight a better regulation of heat will be secured.

TROLLEY TOPICS

"Trolley Topics" is the name of a small pamphlet to be issued weekly during the summer by the Rochester Railway Company. The initial number is dated May 27, and as the publication is to be primarily a summer resort and tourists guide, publication will cease with the number for Sept. 2, 1905. It is the aim of the little magazine to aid the traveler in determining when, where and how to spend his leisure hours to the best advantage, while sojourning in or near Rochester, and to point out to the residents of the beautiful city the points of interests so near their doors (but so often negleeted and overlooked), and to show them when, where and how they can best be reached. Near the center of the magazine are to be found maps, time-tables and other railway and resort information. Interesting reading matter and advertisements fill the intervening pages. "Trolley Topics" is distributed weekly at all towns on the Rochester & Sodus Bay Railway, and Rochester & Eastern Rapid Railway; also at the following resorts: Ontario Beach, Summerville, Windsor Beach, Sea Breeze, Glen Haven and and all resorts on Sodus Bay, Canandaigua Lake and Seneca Lake.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED MAY 30, 1905

790,931. Trolley Catcher; Lucian B. Stanley, Collinwood, Ohio. App. filed July 22, 1904. Details of a spring-drum and ratchet arrangement.

790,939. Switch Operating Mechanism; James C. Waldo, Sharpsburg, and John J. Foster, Avalon, Pa. App. filed Jan. 7, 1905. Two pivotally mounted arms connected through a link with the switch tongue, a single-acting motor having a slide movable thereby, a dog or pawl mounted on the slide, and means operative on the movement of the arms to shift the dog or pawl.

790,974. Car Brake; Joseph C. O'Neill, San Francisco, Cal. App filed Feb. 23, 1904. Relates to means whereby the brake-shoe can be readily adjusted to compensate for wear.

790,991. Brake Hanger; Walter H. Wilkinson, Kingston, N. Y. App. filed Oct. 18, 1904. The shoe-supporting member is pivoted by a bolt to a bracket; a sleeve about the bolt is adapted to maintain the bracket and shoe-supporting member a fixed distance apart.

791,012. Strain Device for Electric Railways; Harry P. Davis and Theodore Varney, Pittsburg, Pa. App. filed Oct. 19, 1904. A strain-clamp comprising two complimentary parts, each of which has eyes at diagonally opposite corners and an intermediate hook at one side.

791,013. Supporting and Strain Device for Electric Railways; Harry P. Davis and Theodore Varney, Pittsburg, Pa. App. filed Jan. 23, 1905. A strain clamp comprising two complementary parts each of which has a longitudinal recess in one face, an eye or ring at one corner and a socket-piece at approximately the middle of one of its edges.

791,031. Supporting Structure for Trolley Wires; Budd J. Jones, Chicago, Ill. App. filed April 2, 1904. A catenary suspension for the trolley wire and a pivotally-supported arm whose free end is fastened to the wire for preventing lateral swing or vibration thereof.

791,079. Rail Clip for Third-rail Insulators; George L. Courtenay and William Courtenay, New York, N. Y. App. filed Aug. 27, 1904. Metallic yoke secured to each end of the insulator bloek, having arms extending upward at eaeh side of the rail, and having separate lugs, which bear on the upper portion of the insulator block.

791,082. Trolley Wire Hanger; Harry P. Davis and Theodore Varney, Pittsburg, Pa. App. filed Oet. 19, 1904. A hanger for grooved trolley wires comprising a rigid bar having a socket-clamp at one end and a claw or hook lamp at its other end.

791,083. Curve Pull-off for Overhead Trolley Conductors; Harry P. Davis and Theodore Varney, Pittsburg, Pa. App. filed Oct. 19, 1904. Comprises a messenger-wire clamp, a trolley-wire clamp and a connecting bar, the ends of which are adjustably seated in sockets in the elamps.

791,150. Railway Rail Cleaner and Oiler; George Huff, Tropico, Cal. App. filed Sept. 26, 1904. Comprises rotary brushes adjustable vertically and horizontally, and a window cut in the bottom of the car for inspection of the adjustment and work of the brushes. Means are also provided for oiling the rails.

791,178. Trolley-wire Switch; Joseph T. Bunn, Washington, D. C. App. filed Aug. 3, 1904. Guards or ears extend upward from the trolley harp, having rollers mounted therein out of alignment with each other, said rollers being adapted to engage grooves or tracks in a non-conducting plate mounted at the intersection of tracks, whereby the trolley engages the proper conductor.

791,181. Brake-Shoe; James R. Cardwell, Chicago, Ill. App. filed Jan. 19, 1903. A brake-shoe comprising a cast-metal body, provided with a longitudinally-extending reinforcing plate of tough metal, having its opposite ends turned inwardly to form hooks, which extend radially into and are embedded in the shoe-body.

791,191. Trolley Guard; Mathias Hartz, Pittsburg, Pa. App. filed Feb. 27, 1904. A frame pivotally mounted at the trolley harp in advance of the trolley wheel, and spring pressed toward the trolley wire, carries a guide wheel and a pair of inclined rollers adapted to close over the wire, thereby maintaining the wheel upon the wire. Means are provided for tilting the guide rollers to release the wire.

791,252. Grab-Handle for Railway Cars; Samuel M. Curwen, Haverford, Pa. App. filed Sept. 6, 1904. A frame comprising two grab-handles, so mounted that one handle will appear on each side of the car stanchion. The frame is movable longitudinally of the car in conjunction with the turning over of the seat back, so that the handle in front only will be in operative position.

790,279. Trolley; George V. Miller, Irwin, Pa. App. filed April 7, 1905. Details.

PERSONAL MENTION

MR. HARRISON H. FEHR, of Easton, has been elected president and general manager of the Easton Transit Company, of Easton, Pa., succeeding Mr. W. Hinkle Smith, resigned.

MR. ROBERT McF. DOBLE, consulting engineer of the Abner Doble Company, of San Francisco, is in Mexico for the purpose of investigating several important hydro-electric long-distance power projects.

MR. H. E. GREIMS, who was formerly chief bookkeeper of the Rhode Island Company, of Providence, R. I., has just been appointed traveling auditor for the Newman properties, and as assistant to General Auditor W. B. Brockway.

MR. H. C. GREEN has resigned as chief train despatcher of the Indiana Union Traction system to accept of a similar position under A. L. Drum, general manager of the Chicago & Milwaukee Electric Railroad Company. Mr. Drum formerly was general manager of the Indiana Union Traction Company.

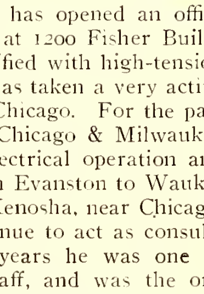
MR. W. CARYL ELY, formerly president of the International Traction Company, of Buffalo, N. Y., has just returned from an extended tour of the Continent. Mr. Ely was accompanied by Mrs. Ely. They took passage on the "Kaiser Wilhelm II.," which arrived in New York on Wednesday, June 7.

MR. GEORGE VOIGT, who has been in the selling and engineering departments of the National Electric Company for nearly five years, has accepted the position of master mechanic of the Illinois Traction System, owned by the McKinley syndicate. His headquarters will be at Danville, and he assumes office June 15. Mr. Oscar F. Prior, his predecessor, leaves to go into business for himself at Oakland, Cal.

MR. GEO. W. ALDRIDGE, of Rochester, has been appointed by Governor Higgins, of New York, as one of the two additional railroad commissioners for the State as provided for in a bill passed by the last Legislature. The selection of the other new member of the board is expected to be announced upon the return of the chief executive from a trip that he proposes to make in the West. Mr. Aldridge is at present secretary to the commission.

MR. W. A. BLANCK announces that he has opened an office as consulting electrical engineer in Chicago, at 1200 Fisher Building. Mr. Blanck has been prominently identified with high-tension electric railway work for several years, and has taken a very active interest in electrical engineering matters in Chicago. For the past year he has been electrical engineer of the Chicago & Milwaukee Electric Railroad Company, in charge of electrical operation and construction of this road, which extends from Evanston to Waukegan, and is constructing from Waukegan to Kenosha, near Chicago, in all about 70 miles. Mr. Blanck will continue to act as consulting engineer for this company. For two years he was one of the engineers on the Arnold Company's staff, and was the one who had particular charge of Mr. Bion J. Arnold's pioneer experiments at Lansing, on single-phase high-tension trolley road, operating single-phase motors. Mr. Blanck is a native of Germany. He was educated at the Wriezen Gymnasium, and at Mittweida College in Saxony, from which latter he graduated as electrical and mechanical engineer. His engineering experience began in Germany, with Siemens & Halske. Later he was connected for six years with the Ganz Company, of Buda-Pest, as engineer for high-tension lighting and power work. Immediately after coming to this country he was for a short time connected with the Chicago Edison Company. It will be seen that his experience is such as to fit him especially for high-tension electric railway work.

DR. JOSEPH E. LOWES, a prominent citizen of Dayton, Ohio, died in California a few days ago. He was a most prominent figure in Ohio politics; was identified with a large number of business enterprises at Dayton and other places, and was for a number of years an active figure in the electric railway industry in that vicinity. Dr. Lowes built the White Line Railway, the first electric railway in Dayton, and the second in Ohio. This line now is a part of the People's Railway. He promoted and built the Dayton & Western Railway, the first interurban line into Dayton, and it has proved one of the most profitable lines in the State. After disposing of this road he promoted and built the Dayton & Northern Railway, and a year ago promoted the Dayton & Muncie Traction Company. He was president of both these lines at the time of his death. Dr. Lowes was interested in other railways, notable the Cincinnati, Dayton & Toledo. He founded the Dayton Electric Light Company, and was prominently identified with the Dayton Home Telephone Company.



J. E. LOWES

MR. DAVID G. HACKETT, superintendent of the Columbia & Montour Electric Railway, of Bloomsburg, Pa., is dead. Mr. Hackett had only been engaged in street railway work since 1902, when he accepted the position of superintendent of the Columbia & Montour Company. He was born in Altoona, in 1856, and after completing his schooling entered newspaper work. He was manager of the Altoona "Tribune" for ten years, and then became manager of the Fort Wayne "Sentinel." He resigned this position to become connected with the Columbia & Montour Company. Mr. N. J. Terwilliger has been appointed acting superintendent of the company to succeed Mr. Hackett. Mr. Hackett is survived by a widow and one child.

MR. GEO. GIBBS on June 1 resigned as vice-president of Westinghouse, Church, Kerr & Company, and as consulting engineer of the Interborough Rapid Transit Company, of New York, to become chief engineer of electric traction of the terminal operation of the Pennsylvania Railroad in New York, and chief engineer of electric traction of the Long Island Railroad. In these positions Mr. Gibbs will have charge of all the electrical engineering and the design and execution of work in connection with the Pennsylvania Railroad's tunnels, yards, terminals, power houses, etc., as well as the design and installation of all electric traction work which the Long Island Company has in contemplation. The work thus put into his hands constitutes the largest electric traction project on any steam railroad in the world. In addition to all this, Mr. Gibbs has accepted the position of consulting engineer of the Metropolitan Street Railway Company, of New York, for its proposed subway work. Mr. Gibbs is best known through his work in connection with the present subway lines in New York, in which he took a very prominent part as engineer in charge of the rolling stock and block signal system. To him, more than to anyone else, is due the credit of installing the steel cars in the subway. These cars were the first steel passenger cars in the world, and were largely of Mr. Gibbs' design. Another of his notable achievements was that of applying in the subway, and for the first time in this country, the overlapping block-signal system. Mr. Gibbs was graduated from the Stevens Institute of Technology in 1882, with the degree of mechanical engineer. From 1882 to 1884 he was engaged as chemist for the Orford Copper Company, and from the latter date to 1888 he was engineer of tests and chemist of the Chicago, Milwaukee & St. Paul Railway Company, Milkaukee, Wis. From 1888 to 1897 he was mechanical engineer of this company. In this position had charge of all car and locomotive design for the road, as well as of its interlocking and track signals. From 1897 to 1902 he was consulting engineer of the Baldwin Locomotive Works, and of the Westinghouse Electric & Manufacturing Company, also chief engineer of the British Westinghouse Electric & Manufacturing Company, Ltd., and of the Continental Westinghouse companies. Since 1901 Mr. Gibbs has been first vice-president of Westinghouse, Church, Kerr & Company, of New York; consulting engineer of the Interborough Rapid Transit Company, of New York; member of the board of engineers of the Pennsylvania Railroad Company's New York tunnel lines and terminals, member of the Electric Traction Commission of the New York Central & Hudson River Railroad Company's New York terminal and electric traction lines, and electrical engineer of the Long Island Railroad Company's lines which are being converted to electricity. In the positions enumerated he had charge of the following work: For the Interborough Company, design of rolling stock, track work, interlocking and signals, shop yards and repair plants, and, in consultation, other railway facilities of the company; for the Pennsylvania Railroad in his capacity as member of the company's board of engineers to carry on this work: special charge of the company's electrical power plants, electric locomotives, power distribution system, and mechanical engineering features of the terminal yards and buildings; for the New York Central Railroad, its electric traction work, including the equipment of its heavy electric locomotives, power plants and distributing system. Mr. Gibbs has also acted as confidential adviser in engineering of the Carnegie Institute, Washington, D. C. He is a member of the American Society of Civil Engineers, British Institution of Civil Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Railway Master Mechanics' Association and the Master Car Builders' Association.

MR. GEORGE GIBBS

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REMITTANCES.—Remittances should be made by check, New York draft, or money order, in favor of the Street Railway Journal.

Change of Address.—The old address should be given, as well as the new, and notice should be received a week in advance of the desired change.

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NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 8000 copies are printed. Total circulation for 1905, to date, 197,100 copies—an average of 8212 copies per week.

American Street and Interurban Railway Association

The new name given above, which will be recommended by the reorganization committee to the members of the American Street Railway Association for adoption, seems by far the best which has yet been suggested. The alternative, American Electric Railway Association, is shorter but does not seem so satisfactory on the whole. In the first place it drops the distinctive word "street," under which the association has achieved a most honorable history. In the second place, it excludes by inference other motive powers than electricity, and while the contingency may seem remote of the extensive employment of other means for propulsion, it is undoubtedly better to define such an association as the street railway association by its field in the community rather than by the motive power most used. The member companies of the association are now and probably always will be principally street and interurban lines, in distinction from trunk line railroads. Many of the latter will undoubtedly adopt electricity before long, so that in a few years the term "electric railway" will soon cease to be distinctive of the street roads, or synonymous in the public mind with a "street railway." Some of these trunk line roads, it is true, may desire to join the Street and Interurban Railway Association, on account of the papers and discussions on electric railway subjects which will be presented at its meetings. The association will no doubt be very glad to welcome any such accessions to its membership, but the greater number of members, in our opinion, will always be those operating on, over or under city streets and those shorter through lines joining neighboring cities, which we have come to call "interurbans."

It is interesting to note in this connection that the associations abroad, corresponding to the American Street Railway Association, have had precisely the same question to settle, and have solved it in the same way that is proposed in the case of the American association. The title of the international association, for instance, up to three years ago, was simply Union Internationale Permanente de Tramways, but this name was changed in 1902 to Union Internationale de Tramways et de Chemins de Fer d' intérêt local, without the word "electric." The names of the German association, Verein Deutscher Strassenen- und Kleinbahn Verwaltungen, and of the British Tramways and Light Railways Association, also correspond exactly in meaning to that approved at the Philadelphia meeting. We believe that this name was wisely selected, and if it is accepted by the members at the general meeting at Philadelphia that it will prove satisfactory in the future.

Street Railway Employees

The bulletin which has recently been issued on street railway employment in the United States by the Department of Commerce and Labor, and which is briefly summarized elsewhere in this issue, is the first attempt, as far as we are aware, to analyze the conditions of street railway employees in an exhaustive way. The subject is certainly one for serious study. The number of men engaged in electric railway transportation, including officers and clerks, now amounts to about 140,000 men, or about one-eighth of those employed in steam railroad transportation. The number is rapidly increasing, and owing to the introduction of electricity there has been a great change in the character of the men and the conditions of their employment. The fact that the majority of these men are concentrated in the large cities intensifies the effect which they exercise on the body politic, and the wages paid them and their conditions of work are subjects which vitally interest the residents in all the cities in the country.

The duties of the position require the employment of men who are both physically and mentally alert, but as a knowledge of the work is readily acquired there are, as a rule, plenty of applicants for positions. This fact in the past has led to the extensive employment of extras, or "trippers," but most companies are now realizing that permanency of employment is necessary to maintain the stamina of the employees, and consequently the efficiency of the service. Much progress has been made in this direction in other ways, as is shown by the establishment of merit systems, the standardization of rules, fixed systems of promotion, mutual benefit associations and in some cases the establishment of a pension fund, all conserving the principle of permanency of employment and looking to the establishment of street railway employment as a life work. With these have come more stringent requirements, both as to age and physical and intellectual condition as a prerequisite for employment. On the other hand, there has been a large increase in wages, amounting to from 50 per cent to 100 per cent, or more, as compared with the horse-car period, as well as a reduction in the hours of labor. Statistics show that the latter at present vary from nine to thirteen hours a day as compared with an average working day of fourteen hours, and instances of normal days of sixteen and seventeen hours each when horses were used.

Speed Records Smashed

The recent inauguration of a regular 18-hour service to Chicago over two separate routes is a sufficient answer to the conservatives who have held that there was no public demand to justify a great increase in railway speeds. When two great trunk lines unite in supplying high-speed service, it is pretty clear that people want to travel at a better pace. The performances of the trial trains sent over the routes as a preliminary were notable in the history of railroading. The Pennsylvania train had somewhat the shorter route, and rolled off the entire run at the rate of 63 m.p.h., including stops, or 68 m.p.h. excluding them. It is reported that 110 m.p.h. was reached for short distances. The New York Central train broke all long-distance records by doing 181 miles in 150 minutes—just 72.4 m.p.h. On the schedule time of eighteen hours it will have to make a trifle over 53 m.p.h., including stops. This will be easily the fastest regular run in the world over anything like a similar distance. The fastest runs for shorter distances are, we believe, those of the Sud Express from Paris to Bayonne, at 54.13, and of the Empire State Express to Albany at 61.2 m.p.h. The former is 486 miles, the latter 143. The new trains are most valuable additions to the passenger service between the two greatest cities of the country, and make a new epoch in fast railroading. Yet, after all, these speeds are not at all startling. They simply involve keeping up for a long run speeds that have been entirely familiar over moderate distances. The run from Baltimore to Washington has been made at such speed for some twenty years past. Nobody has had any doubt that a locomotive can haul a train at a mile a minute or better over considerable distances. But the weak point of the locomotive has always been the maintenance of its best working pace for long periods. This is just the point at which some day we expect to see the electric motor beat it out, just as it did for a short run on the Zossen line. In the case of an electric train there is no crowding of boiler capacity; the automatic stokers, miles away, keep tirelessly about their business, and the motors can spin crowding of boiler capacity; the automatic stokers, miles away, thing becomes the track, and with this in the condition found on our great trunk lines, we see no reason why one of these days we should not have a train running to Chicago in ten hours instead of eighteen. Perhaps the German projects now on foot for the Berlin-Hamburg route will show the way. A regular train at 60 m.p.h. will be an object lesson to which no railway man can afford to shut his eyes. This much is clear, that the need of a faster service between New York and Chicago has made itself felt keenly enough to break through the armor of railroad conservatism. The trains will, to a certainty, be well patronized, and we earnestly hope that they will not be allowed to backslide like the fast service inaugurated some years ago. The demand is a real one we think, people are willing to pay for it, and it ought to be continued. The value of an extra business day is very material to busy men, and once they realize the importance of gaining it, a great stimulus will be given to fast passenger traffic. For shorter runs than that between New York and Chicago, the need of better speed is almost equally great in enabling tired and busy men to avoid travel by night. We congratulate the two great railway systems on their achievement, and trust that it will be the beginning of the new era in traveling to which we have fondly looked.

Developing Vacation Traffic

The development of traffic has of late become one of the most important subjects with which street railway managers are concerned, and unless present indications are at fault, a long season of exceptionally heavy pleasure business awaits the advent of the open car and the unlocking of the park gates. It is reasonable to anticipate a change from the unfavorable weather conditions of the past two or three summers, even though predictions cannot be made far ahead with certainty, because it is high time that the law of averages settled down to work and brought the weather back to normal conditions.

Even though the temperature should fail to come up to the expectations of summer hotel keepers and street railway men, there is every reason for doing whatever is possible to encourage traffic in the coming open season. In the far West the gospel of fresh air has been learned with a thoroughness which few Easterners who have not sojourned in the shadows of the Rockies or the Sierras realize, and it is a poor sort of a day indeed when street railway traffic for pleasure purposes falls much below normal. On roads operating in sparsely-settled territory, the importance of encouraging every possible passenger to ride is greater relatively than the need of creating traffic in a densely-populated city, the bulk of whose business is likely to be travel for other than pleasure purposes.

During the past three or four years a great deal has been done in the way of creating traffic on systems whose cars pass in the vicinity of or actually reach natural or artificial scenic attractions, historic localities or other interesting spots. Much has been accomplished by judicious advertising and a general advocacy of a system's attractiveness, along the lines practiced by steam railroad passenger agents. The steps taken in this direction by the Old Colony and Boston & Northern Railways, of Massachusetts, for instance, which jointly maintain a passenger department in the business center of Boston, has been described in these columns. The New Hampshire Traction Company is another pioneer in the encouragement of pleasure travel, a number of its methods having been described in the STREET RAILWAY JOURNAL.

Small roads with limited resources cannot, of course, attempt such extensive plans for traffic creation as those cited, but it is a desolate community indeed which has no facilities for recreation and pleasure which can be served by the street railways. Something can be done to stimulate traffic, even if it consists simply in a few announcements posted from time to time in the cars. Church and fraternal associations can be encouraged to select the trolley pleasure park for their annual outings and parties of school children to visit historical localities along the line. Vacation trolley trips are worth catering to, and if their inexpensiveness, comfort, freedom from dirt, cinders, smoke and heat are sufficiently emphasized, there is bound to be a compensating return upon the time and trouble taken. The steam railways spend thousands of dollars each year to induce tourists to visit far away wonders, and the mountains of baggage which are piled in the city terminal stations each August prove without question the result of such publicity. Thousands of people cannot afford to take their annual vacations at the shore or in the mountains, but it is rare to find a family in moderate circumstances which cannot travel in the vicinity of its home in the trolley cars, visiting many spots and places of interest not seen before, but brought to its attention by the enterprise of some street railway company. If such traffic is to be secured and held, the roads catering for it must break away from narrow ideas of local service as the main feature and supply good connections, or at least information in available form as to the through service, cost, running time and frequency.

Economy in Handling Coal

Considering the enormous quantities of coal handled each year by street railway companies, it is evidently worth while to endeavor to cut down the cost per ton delivered in the furnaces whenever it is possible to do so. The saving of a single cent per ton in the case of a company which uses 20,000 tons per annum represents $200 reduction in operating expenses, for instance. Assuming that such a road earns one-third of a cent profit out of each 5-cent fare, the foregoing saving in the coal account represents the profits on carrying 60,000 additional passengers during the year.

Many power stations realize the importance of doing away with human labor in handling the coal supply, but a great deal remains to be done in the elimination of needless expenses between the coal train or barge and furnaces. This is not intended as a brief for mechanical stoking under all conditions, for in small plants hand firing often gives ample satisfaction. Rather is it the idea to point out a few striking features of the coal-handling problem which, while well recognized in the abstract, are often neglected in the concrete.

It scarcely seems necessary to state the simple requirements of the problem. In general, the shorter the path between the coal car or barge and the boiler room, the better. The expense of moving the fuel by hand power is often relatively large. In large plants there should, if possible, be no need of employing four or five men to push coal carts 200 ft. or 300 ft. from the receiving bins to the boiler room. If such arrangements cannot be avoided, and in some old plants the conditions are very disadvantageous, a narrow gage track can at least be put down for the expedition of the car movement. It is ridiculous to spend several thousand dollars on a mechanical conveyor system and then pay the cost of operating it by a wasteful steam engine instead of an electric motor, feeding the entire system in the first place from bins 100 yds. away by wheelbarrows propelled on the Italian system. The wages of three or four laborers capitalized often amount to far more than the investment and operating cost of installing a complete coal-handling system. Here is the weak point—the economical handling of the fuel is only partly worked out, between the car and the furnaces. It is the same thing as trying to secure high operating efficiency by belting the latest type of steam turbine to a shunt-wound bipolar generator of the early 80's.

The economical handling of coal does not necessarily imply the installation of a large amount of machinery, in many cases. When the coal cars can be run upon a trestle extending at a grade well above the boiler-room floor, the force of gravity can be employed more economically than any other known agent. Fundamental as this fact is, it is often lost sight of by power plant designers. Again, it is a simple matter to rig up a coal-handling locomotive for use around the power house, when it is necessary to move the fuel from the bins to the boiler room at the same level. The problem is by no means solved when the conveyor buckets begin to travel unless the human element has been reduced to the lowest possible quantity. Given from 5000 kw upward in generating equipment, capable of delivering a kw-hour of energy at the station bus-bars for 7 mills or 8 mills operating cost, there would seem to be little excuse for the use of muscular transportation of fuel. Finally, matters ought never to be allowed to reach the pass where, as in a recent case, automatic stokers located 8 ft. above the fireman's head were supplied with some 60 tons of coal per day, every ounce of which was shoveled upward from a wheelbarrow by sheer force of biceps. A little thoughtful consideration of the movement of the fuel in a plant sometimes well repays the manager's trouble.

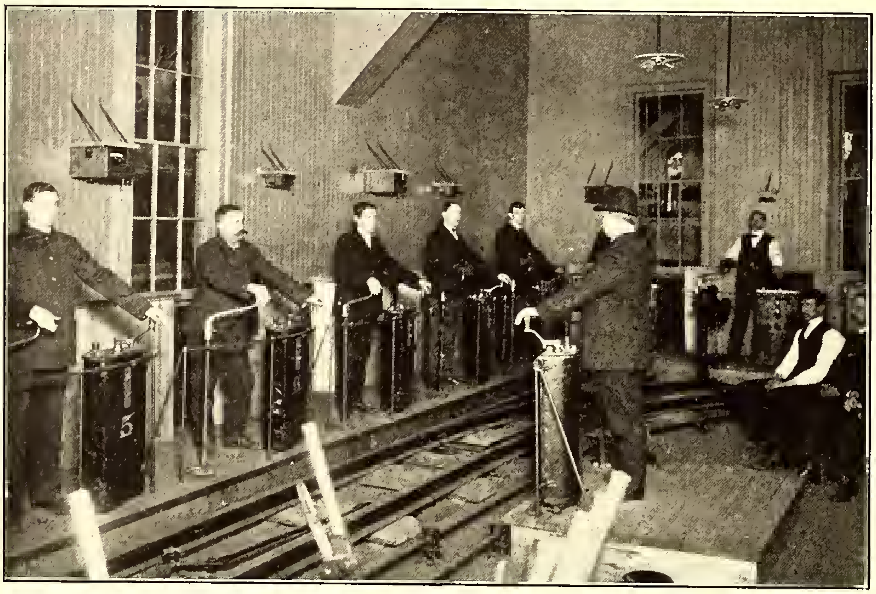
Educating Shop Men

One who has not been in intimate contact with the workmen in the repair and inspection shops little realizes the lack of encouragement given in some to the ordinary workman to obtain an understanding of the electrical apparatus with which he is working. The more intelligent employee can readily secure information about the motors and wiring because he will know just how to obtain it. The various periodicals and the books which are published upon these subjects, supplemented by a sufficient amount of good, hard reasoning, will give him a grasp of the principles governing the action of the apparatus. But there is a class of workmen who hardly know of the existence of the books or papers that would give them the information desired. They are not illiterate men either. They have good reasoning powers along mechanical lines, as is shown by the correct ideas concerning the operation of the apparatus that they secure of themselves without any external aid. Some of these men, if assisted by a few books and diagrams, would make themselves much more valuable to their employers.

In a few cases this condition of affairs can be accounted for by the kind of man occupying the position of foreman. He may be one of the kind who imagines he holds his superior position by virtue of the ignorance of those under him, some of whom might show more ability than himself if they should once be given a chance to learn more. Narrow-minded foremen of this kind are usually officially short lived and give way ultimately to men of broader views. The best foremen are the men who can produce the best results for a given expenditure, and the only way on earth to do this is to have a force of men working at the highest degree of efficiency, discipline and intelligence, and by encouraging and requiring the men to learn all they can.

A MOTORMAN'S SCHOOL SYSTEM IN BROOKLYN

An interesting system for instructing new motormen for service upon surface lines has recently been inaugurated upon the surface division of the Brooklyn Rapid Transit Company. The plan followed is primarily to teach the student how properly to operate the controller, cut-out either motor, insert a fuse and cut-in a circuit breaker. The company does not believe that it is practicable or necessary to instruct the motormen of a large city system very much in regard to the details of the car wiring, and that any attempt to explain the mechanical or electrical construction of a car, beyond that required to perform intelligently the duties described above, only tends to confuse a green man in the performance of his regular work. For this reason diagrams of car wirings are not shown the students as on some roads. Especial attention is given to impress upon the students the desirability of running on the safe points of the controller. There are so many congested districts in Brooklyn that a considerable part of the operation has to be on the resistance points. This naturally has a bad influence on the men, and it is one reason why so much trouble is taken to emphasize the economical positions of the controller handle.



INSTRUCTING A CLASS IN THE MANIPULATION OF THE CONTROLLER AND BRAKE HANDLES

The school is at the Fifty-Eighth Street and Second Avenue car house of the company, and contains a waiting and examining room, 20 ft. x 28 ft. in size, and the instruction room, 20 ft. x 42 ft. in size. In the latter are arranged the dummy car platforms, with brake staffs and controllers of standard construction, the instructor's platform, sample interlocking switch and signaling apparatus, and electrical apparatus for demonstration. The scheme of instruction adopted involves a considerable amount of study by the students, supplemented by drills.

INSTRUCTION APPARATUS

The arrangement and details of the apparatus in the instruction room are shown in accompanying drawings. The instruction room is equipped with twelve dummy car platforms for the students, of which six are arranged on one side opposite the instructor's stand, and three at either end, thus permitting a clear and unobstructed view for each student. These platforms are elevated 9¼ ins. from the floor, which facilitates the arrangement of a gong and brake mechanism beneath such as used upon the standard car. The brake staff is arranged to wind up against spring pressure, offering thus a resistance to the practice-braking similar to that encountered in actual car operation. The details of the dummy car platform and the arrangement of spring mechanism for the brake are shown in an accompanying drawing; the pull is equalized throughout by a novel leverage method, as shown. The controllers on the platforms are of the K-11 type, which is very extensively used in Brooklyn. Like the foot gong, they are arranged in standard location, although they are not connected electrically.

One of the most important features of the school is the electrical apparatus that has been devised for demonstrating the effect that the car controllers have upon their motors in the starting of cars. This was one of the most difficult parts of most schemes of instruction, and accordingly is of more than usual importance. It consists of a combination of incandescent lamps and signs, by which the cycle of events resulting from the controller's action upon the motor circuits may be observed and understood by those not having a technical knowledge of electric traction methods. These lamps are operated from the instructor's controller, so that he may be able to demonstrate his explanations as he progresses. The arrangement and design of this electrical sign equipment, as well as the diagram of electrical connections with the controller, are shown in accompanying illustrations.

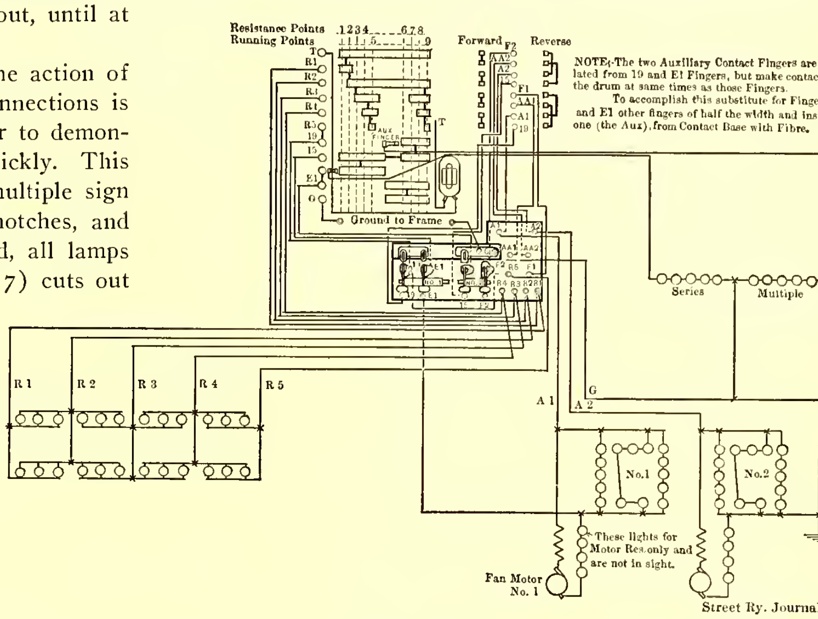
The system of visual signals is laid out for a two-motor car equipment, two of the electric signs being used to represent the motors, another to take the place of the resistances, and two others to indicate the series and multiple positions of the controller. The lamps on the signs are so connected to the instructor's controller that they are caused to light up whenever the apparatus designated by them comes into circuit. Thus, throwing the controller to No. 1 position, lights up Nos. 1 and 2 motor signs, the series sign and all the resistance lamps, all lamps burning very dimly; the next step cuts out one-quarter of the resistance sign (six lamps) and the other lamps grow somewhat brighter; step No. 3 cuts out six more resistance lamps; step No. 4 another six, with correspondingly increased brightness, while No. 5 cuts all resistance out and the lamp


A SCENE IN THE OFFICE OF THE INSTRUCTION HEADQUARTERS

filaments are up to a bright red. This indicates the full series, or first safe running, position. Each motor sign has connected in with it an electric fan, whose rate of rotation is made to represent the rotation of the motor armature, the speed increasing very noticeably as the resistance is cut out, until at full series, it is running at about half speed.

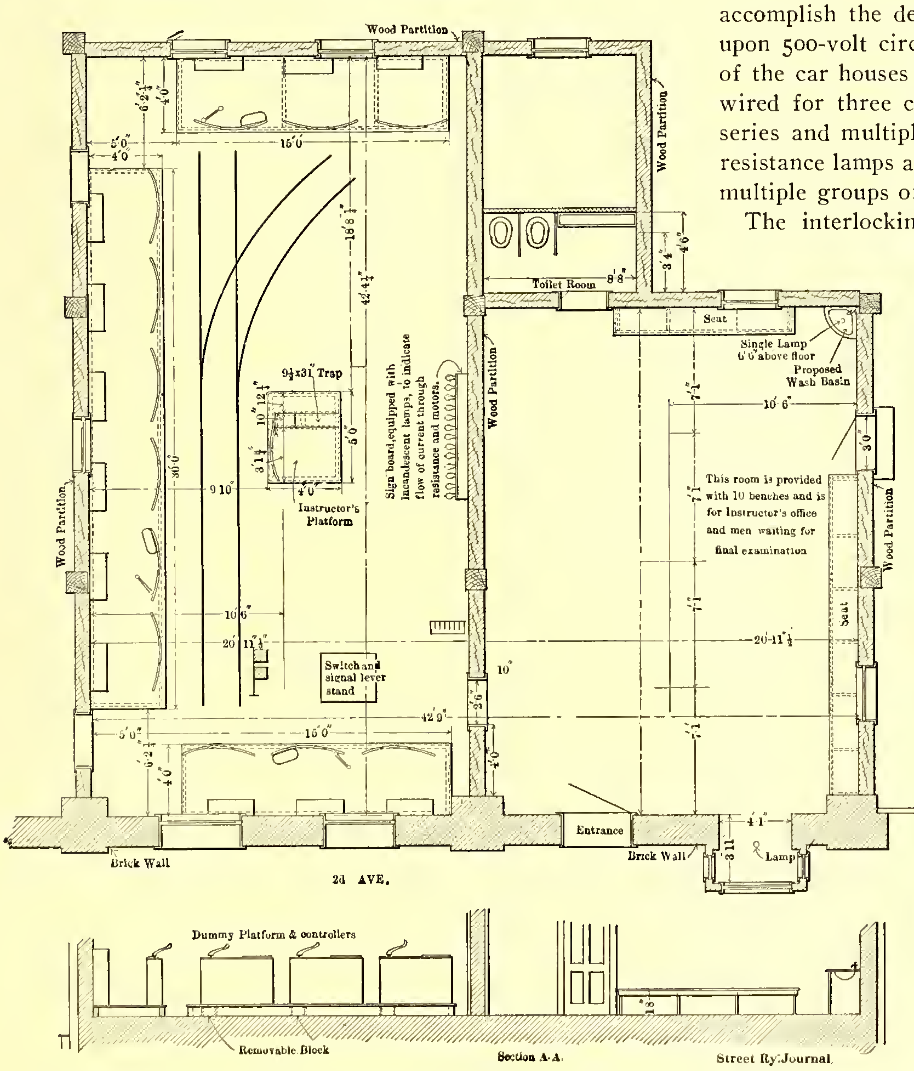
In passing to step No. 6 upon the controller, the action of changing over from the series to the multiple connections is made clear to the students, enabling the instructor to demonstrate forcibly the necessity of making this step quickly. This position cuts out the series sign and lights the multiple sign below to indicate the first step of the multiple notches, and three-quarters of the resistance lamps are lighted, all lamps burning still dimly. The next position (step No. 7) cuts out six resistance lamps, and step No. 8 the same number, and is followed by increased brilliancy of lamps and higher speed of the fans. Step No. 9 cuts out the last of the resistance sign and causes the lamps to glow at full candle-power and the fan motor to operate at full speed, this being thus demonstrated as the safe running position for full multiple.

Another interesting feature of the arrangement of connections is that it enables the instructor to show the method of cutting out one of the motors in case it is damaged or disabled and it is desired to run home on the other. The effect of opening either cut-out switch is readily shown by the fact that only the lights upon the sign of the other motor will burn, and also that the controller cannot be thrown into multiple position. The arrangement and design of the sign does not partake of emblematic wiring diagram figures, the forms of signs, lettering and arrangement having been calculated to appeal most strongly to the uneducated mind, and thus most successfully accomplish the desired results. The signs are wired for use upon 500-volt circuits so as to be adaptable to service in any of the car houses of the company. The motor signs are each wired for three circuits of five 100-volt lamps each, and the series and multiple signs for a single circuit each, while the resistance lamps are low-voltage lamps arranged in four series-multiple groups of six each.



WIRING DIAGRAM, SHOWING CONNECTIONS TO LAMPS SERVING AS RESISTANCES

The interlocking switching and signaling equipment consists of a two-blade signal, erected full size in the instruction room to cover a full list of train movements at a switching point upon a short length of track as laid in the room between



GENERAL PLAN AND PART ELEVATION OF THE INSTRUCTION ROOM

THE INSTRUCTOR PREPARING TO GIVE SOME POINTERS IN CONTROLLER AND BRAKE OPERATION the instructor's stand and the dummy car platforms. The equipment is complete, and is of the latest improved models of the Union Switch & Signal Company, as have recently been installed at all interlocking points upon the elevated and suburban lines of the company. A stand of six levers operates the signals, switch and "scotch block," and also the dwarf signal

THE INSTRUCTION SYSTEM

The instruction system does not end with the school room, but has been logically extended to cover the requisite essentials to complete mastery of the subject. Several different records and reports are involved, and while they added somewhat to the work of this department, they verify the thorough knowl-

Page 1

STUDENT MOTORMAN'S PRIMER

The following information is given to assist you in the instruction course. Later, when assigned to a Depot for instruction, you will study carefully the book of rules and also rules and hulletins at the Depot.

The motorman's position is at the front end of the car and he must always pay strict attentioo to operation.

Electric cars are operated by means of an electric current which is brought from the Power Houses through feed and over-head trolley wires. From the trolley wires, the current passes through the car, going first through the circuit breaker, cut-out switch, or fuse; then through the controller, then through the motors and then to the track. Through the track it is returned to the Power Houses. To operate the motors, it is necessary for the circuit to be complete. In the circuit between the controller and the motors, there is a collection of plates or grids, called the "resistance." When the controller is turned on one notch, the current has to pass through this resistance which holds it hack so that only a small amount of the current reaches the motors and the car is moved at a slow speed. When the controller is put on the second notch, less of the resistance is used and so on until at the fifth notch the current passes direct to the motors without going through the resistance. The current flows through the circuit like water flows through a pipe; the controller and resistance acting like a faucet, and so when only a small amount of current is used, the current is held back in the circuit as water in a series of pipes, and a strain is put on the resistance. For this reason, the cootroller should be operated as much as possible on the points where there is no resistance; namely, the fifth and ninth.

In order to regulate the speed and work of the motors, they are made and wired so that they can he operated in two ways, called "series" and "multiple". The motors are operated in "series" when the controller is operated from the first to the fifth points, and in "multiple" when the controller is between the sixth and ninth points. When the current flows through the motors in "multiple" it passes to each motor separately, so that each motor gets the full pressure of the current. To illustrate the operation of the motors in "series" and "multiple", the following sketches have been made. Figures No. 1 and 2 show, respectively, motors and water wheels operated in "series" with a division of power. Figures No. 3 and 4 show, respectively, motors and water wheels operated in "multiple", each drawing the full pressure of power.

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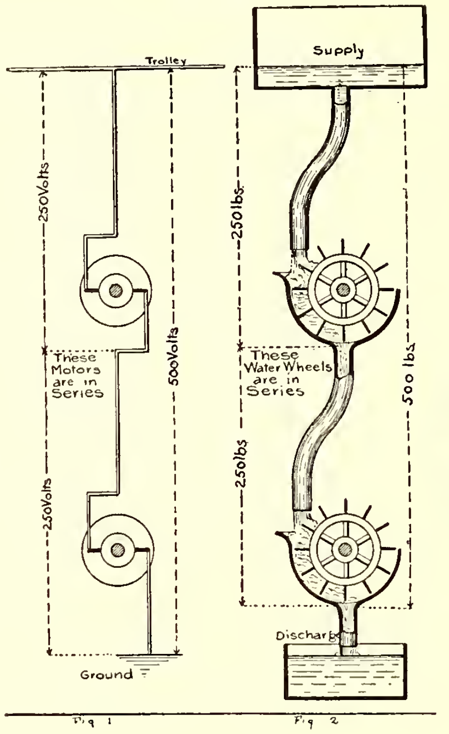

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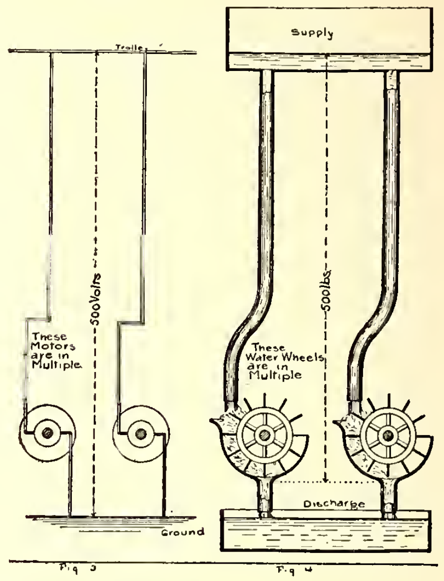

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The following rules and information will explain all questions on Instructioo Sheet No. 1, and are nnmbered to correspond with them:

1.—One bell from the cooductor means stop at the next crossiog or station.

2.—Two hells from conductor means go ahead.

3.—Three bells from conductor:

A. When car is standing, means back slowly.

B. When car is moving, means stop immediately, and is only used in emergency.

4.—The first thing to do when boarding car preparing to go out, is to put bandles on properly, and see that overhead switch or circuit breaker is cut-in, and then throw reverse handle to forward positioo, in the direction in which the car is about to move. Stand close to the controller box between control and brake with right hand on hrake handle and left on control handle.

5.—There are nine points on the controller, the first five are called "series" poiots, and the last four are called "multiple" points.

6.—In order to start car, the hrake must first he released and control moved from the "off" position to the first notch.

7.—The left hand should always be put on the wooden top of the ntrol handle, with the top of the handle in the palm of the hand.

8.—The left hand must keep a firm grasp of the cootrol haodle at all times when control handle is not in the "off" position.

9.—To increase speed, power must be turned on one notch at a time, pausing at each notch, before moving control to the next.

10.—The fifth—full series—, and the ninth—full multiple—are called the safe running poiots on the controller. Cars should not be operated long on the other poiots.

11.—Running on resistance points, 1, 2, 3, 4,—6, 7 and 8, wastes power, causes overheating, and is dangerous to the mechanism of the car.

12.—Operating the controller too quickly will give the motors too much current and will cause jerking of the car, spinning of the wheels, or blowing of the circuit breaker or fuse.

13.—When car is runniog at full speed with controller off, the controller may he notched up quickly, because the motors do not have to overcome the ordinary resistance due to starting.

14.—Great care should he exercised in moving control from the fifth to the sixth positions, series to multiple. If moving slowly, there is danger of dragging an arc in the controller and seriously damaging it.

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15.—Power should be thrown off by a quick, steady motioo, without pausing at any notch.

16.—It is dangerous to throw power only partly off.

17.—When running with control on full multiple, or on any multiple point, the only way to bring control handle to any series point, is to throw handle to the "off" position ond then notch it up to the point desired.

18.—When necessary to throw a little power on, aod then off, quickly, it is hest to notch up to the second position and then throw off from that point. If possihle, however, control should be notched up to full series, before throwing handle off. It never should he notched on and off from the first point in a jerky manner.

19.—The brake must always be released before applying power. If it is kept on, it will give too much work to the motors and they will become overheated and damage the equipment.

20.—Brake must always be kept off when power is on. When running in the heart of the city, or when approaching pedestrians or vehicles, brake should be wound so as to take slack out of chain, bnt not set the shoes.

21.—To make a full stop, control must be thrown to the "off" position and the brake set. When car is almost stopped, brake should be partly released to avoid a jerky stop.

22.—To reverse car, control must be in the "off" position, then reverse handle pulled hack as far as it will go and the power applied to the first or second notch.

23.—The right hand must keep a firm hold on the brake at all times when the car is in motion.

24.—If trolley should leave the wire while car is in motion, control handle must he thrown to the "off" position and car brought to a stop with the hrake.

25.—All cars are not equipped with circuit hreakers. Cars withont circuit breakers have an overhead switch which is to be cut-in at both ends of the car before it is started on the road. On this type of car, there is a fuse uoder the car which will be blown if a severe strain is put on the equipmeot.

26.—When changing ends on cars provided with circuit breakers, the breaker on rear end of car should he cut-out and the breaker on front end of car should be cut-in.

27.—If over-head circuit breaker on car should release while car is in motion, control handle should he thrown to the "off" position and circuit breaker cut-in hy hand. Circuit hreaker must not be struck with switch rod or operating handle.

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28.—If the circuit breaker releases and after being cut-in, releases again, it indicates that there is some trouhle with the mechanism of the car, unless it has been caused by too quick applicatioo of the curreot. If this happens—

A. When control is heing operated in series, it is an indication that the trouhle is probably with the No. 1 motor, and this motor should be cut-out and operation tried with the No. 2 motor.

B. If circuit breaker blows when control is being operated in multiple, it is an indication that there is trouble in No. 2 motor, and it should be cut-out and car operated with No. 1 motor.

29.—To cut-out either motor it is necessary to see that circuit breaker is open, and then open control box at the front end of the car, and pull open No. 1 switch at the hottom of the control box. Then circuit breaker should he cut-in. When operating with only one motor, either No. 1 or No. 2, control handle should only be put on the series positions.

30.—If circuit hreaker releases after cutting out No. 1 motor, while it is still released the controller box should be opened, No. 1 motor switch cut-in and No. 2 cut-out.

31.—If circuit breaker releases after cutting out No. 2 motor, it should be cut-in and No. 1 motor tried, unless this bas already been done. If both motors have been tried and circuit breaker will not hold, the breaker should be left out and car pulled or pushed to Depot.

32.—Motormen must not hold or fasten circuit breaker. It is the safety valve of the equipment and must be left free to operate

33.—Fuse boxes are located in different places, in different types of cars, but are always somewhere in the circuit between the trolley pole and the controller. They are generally located underneath the side of the platform or front part of car.

34.—The fuse hox cootaios a fuse which is an electric conductor which will only carry a given amount of current. When a strain is put on the equipment, or the mechanism of the car gets out of order so that an unusual amount of current is brought through the circuit, the fuse will hurn out and keep the current from getting to the motors.

35.—To put in a new fuse, the circuit breaker must be open, old fuse removed from the fuse box, and a new one pressed fully into lace so that good contact is made.

REPRODUCTION OF THE SIX PAGES OF THE INSTRUCTION PRIMER OF THE BROOKLYN RAPID TRANSIT COMPANY

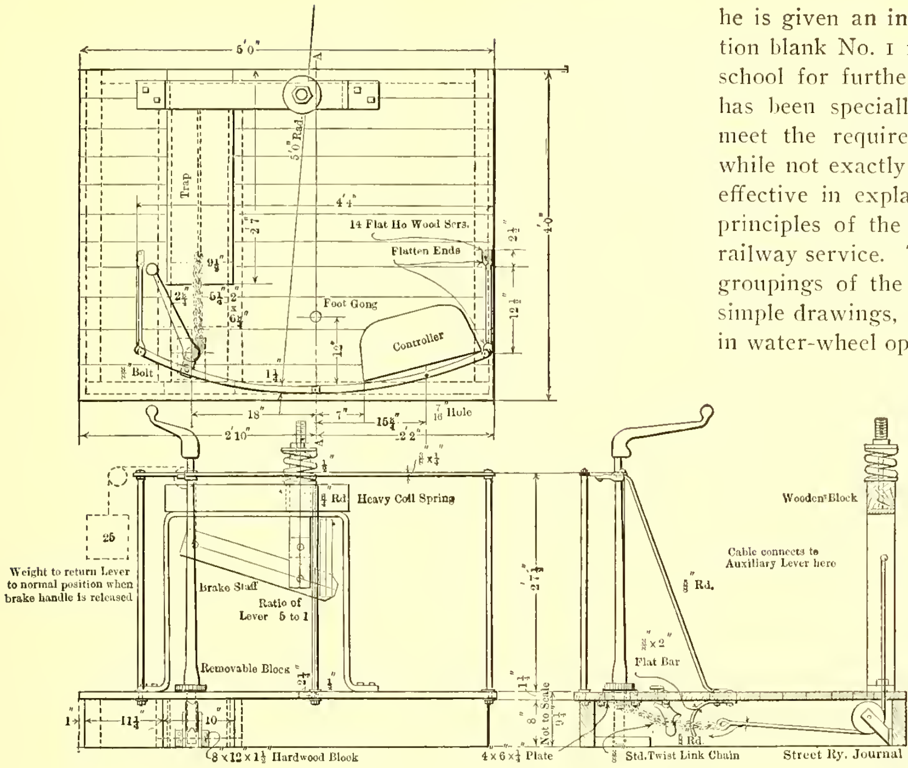
on the branch line, which serves to protect against reverse movements upon the branch when the signal is set for the main line. The reason for instructing the surface car motormen as to signals is that many of the surface car lines are operated to the ocean resorts in the summer over the elevated lines in the suburban districts, which are fully interlocked at all switching points, and thus all motormen employed are trained for the "Coney Island service."

edge of the course by the applicant for employment. The blanks for the motormen's instruction cover different stages—first, preliminary; second, the examinations by the instructing motormen, the shop foreman and depot master; third, the starters' records for students in practice; fourth, the final examination by the chief instructor at the school, and finally, the record for the six days of probationary work with part pay.

When an applicant for a position as motorman is received, he is given an instruction pamphlet or "primer," and instruction blank No. 1 for preliminary study before reporting to the school for further instruction and examination. The primer has been specially prepared by the operating department to meet the requirements of the non-technical applicants, and while not exactly a strictly technical treatise, has proved very effective in explaining in few words and a popular way the principles of the railway motor and its operation in electric railway service. The actual meaning of the series and multiple groupings of the motors is effectively set forth by means of simple drawings, which liken the current flow to that of water in water-wheel operation. This primer is 4 ins. x 6 ins. in size and contains six pages, embracing the diagrams, explanations and thirty-five rules. It is reproduced on the opposite page.

Blank No. 1 is not reproduced in this article on account of lack of space, but is a series of questions based upon the primer, by which the mastery of the principles given in it is tested. The questions are arranged in the same order as the points are stated in the primer. This aids in keeping them in their logical order, in the mind of the student, and in impressing him with them.

After having passed this examination satisfactorily, the student reports to the chief instructor at the school and is given



DETAIL OF INSTRUCTION PLATFORM

BRT 7½M. 11-1-4

Brooklyn Rapid Transit System

EMPLOYMENT DEPARTMENT

FILE No. ....

Instruction Blank, No. 2

.................................190

.................................Student Motorman No..................

The questions on this blank are to assist motormen in giving proper instruction to students. All instructing motormen must see that students thoroughly understand the operation of cars in accordance with the Rules and Regulations of this Company and are fully acquainted with all conditions, a knowledge of which is necessary for safe operation over their particular lines.

QUESTIONS.

R W 1. What are the bell signals? Rules 63, 64, 65.

R W 2. What is the proper operation in taking car from house? Rule 141.

R W 3. What is the rule about operating car from rear end? Rule 73.

R W 4. How far, would you back car without changing ends? Rule 73.

R W 5. Is it ever proper to start car without bells from conductor? Rules 89, 159.

R W 6. How do you operate control in starting car? Explain fully. Rule 142.

R W 7. What are the safe and economical running points? Rule 149.

R W 8. How do you operate when passing intersecting streets? Rule 169.

R W 9. Give exception to this rule, by stating what is proper operation at "stop streets," and also what the rule is about "school stops." Rules 158-159.

R W 10. What are the rules about operating on schedule? Rule 74.

R W 11. Give time and transfer points on this line?

R W 12. How do you stop car? Rule 161.

R W 13. Is it proper to run with both brake and power on? Rule 142.

R W 14. How do you operate and start car on down grades?

R W 15. What is "skidding" wheels, when is it likely to happen, and why should we avoid it? Rule 163.

R W 16. What is the rule about operating car, when its condition or that of the rail, makes it hard to stop? Rule 165.

R W 17. When is it proper to use sand? Rule 151.

R W 18. What is the rule about looking ahead, and talking with passengers? Rules 40, 167.

R W 19. What is the rule about approaching wagons and other vehicles? Rules 170, 173.

R W 20. What is the rule about approaching pedestrians and children? Rule 171.

R W 21. What is the rule about passing other cars, wagons, and obstructions on the street? Rules 173-175.

R W 22. Where should two cars never pass each other? Rule 174.

R W 23. What are semaphore signals? Rules 220-226.

R W 24. Where are such signals used? Rule 219.

R W 25. What does red light mean? Rule 200.

R W 26. What does green light mean? Rule 201.

R W 27. What does white light mean in place of red or green? Rule 204.

R W 28. When semaphore arm of blade extends straight out, horizontal, what does it mean? Rule 220.

R W 29. When it is dropped? Rule 221.

R W 30. Where are two semaphore signals used? Rule 222.

R W 31. Which movement does each cover? Rule 223.

R W 32. How should all steam railroad crossings be passed? Rule 89.

R W 33. When operating open car, what rule should be followed about approaching wagons or other obstructions? Rule 127.

R W 34. How do you operate over facing point switches, and all special work? Rule 177.

R W 35. What rule do you follow when you see or hear a fire engine on the street? Rule 92.

R W 36. What is the rule in regard to stopping for passengers? Rule 75.

R W 37. What is the rule in regard to spacing of cars? Rule 181.

{R– signifies right.
{W– " wrong.

R W 38. What is the rule about operating car through water? Rule 193.

R W 39. What special rule governs operation through dark places and in foggy weather? Rule 182.

R W 40. What is the "100 foot" rule, governing operation at street railway crossings? Rule 168.

R W 41. What indicates which street car has right of way at crossing? Rule 168.

We have instructed ....Badge No. ....

and believe him to be thoroughly competent.

LINE	DATE	NO TRIPS	SIGNATURE OF INSTRUC. MOTORMAN	BADGE No.

I have instructed student on questions 1 to 41, have examined him on same, and find him competent.

....
Boss Motorman.

I have received instruction from all motormen whose names appear above, on all points covered by questions No. 1 to 41, and also have been examined on same by Boss Motorman.

....

Dated, ...190

FIRST AND SECOND PAGES OF INSTRUCTION BLANK NO. 2

EXAMINATION BY SHOP FOREMAN AT DEPOT.

R W 42. How many points are there on the controller?

R W 43. What are the safe running points?

R W 44. What is the danger of running on other points?

R W 45. What will happen if the controller is operated too quickly?

R W 46. Why can controller be operated more quickly on car running at full speed than when starting car, moving slowly?

R W 47. What is the danger of slow movment, or stopping of control handle between 5th and 6th notches, series and multiple?

R W 48. How do you throw power off?

R W 49. Is it dangerous to throw power only partly off?

R W 50. When running in multiple, what is the only way to bring control to full series?

R W 51. When necessary to throw a little power on and off quickly, what are the best points to notch to and throw off from?

R W 52. What do you do with the brake before applying power?

R W 53. How do you keep brake when power is on?

R W 54. What is "skidding" wheels, and how do you avoid it?

R W 55. How do you make a full stop?

R W 56. If trolley should leave wire, while car is in motion, what would you do?

R W 57. If overhead circuit breaker on car should release, while car is in motion, what would you do?

R W 58. Are all cars equipped with circuit breakers?

R W 59. What would you do with circuit breaker when changing ends?

R W 60. If circuit breaker release while operating car, what would you do?

R W 61. If circuit breaker releases again while operating controller slowly, what would you do?
A. If controller in multiple?
B. If controller in series?

R W 62. How do you cut out No. 1 motor?

R W 63. If circuit breaker releases after cutting out No. 1 motor, what would you do?

R W 64. If circuit breaker releases after cutting out No. 2 motor, what would you do?

R W 65. Is there ever any excuse for motorman holding in circuit breaker?

R W 66. In what part of car is fuse box located?

R W 67. Where are spare fuses kept?

R W 68. What inspection must you give car before taking it out?

R W 69. If brake becomes disabled, how would you stop car when running up grade?

I hereby certify that I have instructed Student Motorman................................

have examined him on questions No. 42 to 69 and find him competent.

.... *Shop Foreman.*

Dated, ... 190

EXAMINATION BY DEPOT MASTER.

R W 70. How and when do you report for work? D. R

R W 71. What is the rule about being excused? D. R.

R W 72. What is the rule about reporting for work when assigned away from your own depot? D. R

R W 73. What is the rule about sickness? D. R.

R W 74. What are the rules about personal appearance, use of liquor, gambling and smoking? Rules 7, 8, 34.

R W 75. What is the rule to follow when you are in doubt as to what to do?

R W 76. How do you test car when taking it from depot? Rule 139

R W 77. Who has charge of car? Rule 36.

R W 78. Who may operate your car while you are on duty? Rule 35

R W 79. What is the rule about talking while operating car? Rule 40.

R W 80. Who may ride on front platform? Rule 43.

R W 81. What are the rules about closing gates and adjusting chains and side bars? Rules 44-45.

R W 82. What are the rules in regard to accidents and making reports of them? Rules 50 to 57.

R W 83. What are the rules in regard to ejectments? Rules 58 to 62.

R W 84. Name all the bell signals received from conductor and explain them. Rule 63.

R W 85. Name all bell signals which you may give the conductor, and explain them. Rule 64.

R W 86. Explain signals by gong. Rules 66-67.

R W 87. What are the proper stopping places for discharging and receiving passengers? Rule 70.

R W 88. Where should rear platform be when car is stopped for passengers?

R W 89. What is a regular stop? Name several. Rule 69.

R W 90. What is the rule in regard to wrong track movement? Rule 72.

R W 91. What is the rule about backing cars? Rule 73.

R W 92. What is the rule about operating on schedule time? Rule 74.

R W 93. What is the rule about waiting for passengers? Rule 75.

R W 94. What would you do if you found a broken trolley wire? Rule 76.

R W 95. If control becomes disabled when car is in motion, what would you do? Rule 77.

R W 96. If the car becomes electrically charged, what would you do? Rule 80.

R W 97. If you are unable to move car, what would you do? Rule 79.

R W 98. If your car is being pushed by another, what signals would be used, what would your position be and what would you do? Rules 83-84.

R W 99. What should you do when current is off line, and when would you start? Rule 87.

R W 100. When disabled car is being pushed or pulled, what should you do with circuit breaker? Rule 77.

R W 101. What is the railroad crossing rule? Rule 89.

R W 102. How would you operate when Fire Department vehicle is running upon the street? Rule 92.

R W 103. How would you leave your car after pulling in? Rule 93.

R W 104. What is a school stop and when is it effective? Rule 159.

R W 105. When stopping at near side of street, where must you stop? Rule 158.

R W 106. What is the rule about filling sand box? Rule 164.

R W 107. What is the rule about reporting condition of cars on shop sheet? Rule 166.

R W 108. How should cars be spaced in down-town and suburban districts? Rule 181.

R W 109. What is the rule covering operation at street railway crossings? Rule 168.

R W 110. How do you operate car when approaching any crossing? Rule 169.

R W 111. What is the operating rule when there is a fog or similar condition? Rule 182.

R W 112. Show how a lamp or flag should be swung to mean stop. Rule 215.

R W 113. To mean go-ahead. Rule 216.

R W 114. To mean back. Rule 217.

R W 115. What would you do with operating handles when leaving car? Rule 154.

I hereby certify that I have instructed Student Motorman................................

have examined him on questions No. 70 to 115, and find him competent.

.... *Depot Master.*

Approved

.... *Division Superintendent.*

Dated, ... 190

THIRD AND FOURTH PAGES OF INSTRUCTION BLANK NO. 2

10M 11-1-4

Brooklyn Rapid Transit System
EMPLOYMENT DEPARTMENT
Instruction Blank, No. 3

FILE No.

.... 190

STARTER'S STUDENT RECORD

.... Student Motormen / Conductor Badge No. ....

DATE	LINE	TOTAL TIME From	To	NO. TRIPS	INSTRUCTOR	BADGE

The above is a correct record and has been checked against Instruction Blank No. 2, hereto attached, which has been properly certified to by instructors.

.... *Starter.*

INSPECTOR'S CERTIFICATE

We have checked this student's work and have found him competent.

DATE	SIGNATURE OF INSPECTOR	BADGE NO.	DATE	SIGNATURE OF INSPECTOR	BADGE NO.

.... 190 ... *Correct,* .... *Div. Supt.*

UPPER AND LOWER PARTS OF INSTRUCTION BLANK NO. 3

a few hours' instruction in the essentials of car operation, by means of the apparatus there. This gives him a working knowledge of the controller and brake operation, and also of the auxiliary equipment before he goes out on the car for practice service. This is the point at which each student is assigned to a dummy platform in the instruction room and taught the proper methods of handling the controller, brakes, circuit breakers, etc., and is drilled in bell signals, etc. After this the student is given about two days' instruction on a school car operating on one of the suburban divisions of the company, in charge of an instructor. He is then given a preliminary examination, the results of which are recorded upon each man's blank No. 1 and retained on file by the company.

The next step is to assign each motorman whose preliminary examination has proven satisfactory, to some car house from which he must operate over every line under the care of experienced motormen, one or more of whom are retained at each car house with extra pay for the purposes of instruction of students in the practice service. These men give the students the practical advice and assist them in overcoming their personal defects in operation. This course of instruction includes practical experience on the Coney Island lines as well as on the city lines. If the applicant shows aptitude in the practical manipulation of the controller on the road, he is given the examination on instruction blank No. 2 to determine his familiarity with the rule book. This blank has four pages. The first two are reproduced on page 1059, and cover questions 1 to 41. These relate to rules from the surface division rule book, and the examination is in charge of the "boss" motorman, who must certify to the grade of the applicant and to the number of trips he is taken over the various lines of that division. The third and fourth pages of this blank contain spaces for the examination of the student by the shop foreman at the depot upon questions Nos. 42 to 69, and by the depot master upon questions Nos. 70 to 115. The letters R and W before each question are to be checked off, depending upon whether the answer is "right" or "wrong."

This examination blank, as will be seen, repeats some of the questions used in blank No. 1, and this policy of repeating fundamental questions is followed in the blanks issued by the company. This assists in impressing all these facts on the minds of students. It will also be noticed that all the questions on blank No. 2, and this also applies to later blanks, are answered in the rule book and that the number of the rule in each case is printed at the end of the question. The purpose of this is to induce the men to study the rule book and appreciate its importance, an important point with new men.

The practice runs of each students, as recorded upon blank No. 2, are counter checked by the car house starters upon blank No. 3, shown herewith. This records the lines over which each student runs a car, the total time and number of trips, and name of the "boss motorman" in charge. Space is also provided for the signatures of inspectors who have checked up the students work and found it satisfactory.

After this, each student is subjected to a final examination at the Fifty-Eighth Street school, as provided for upon instruction blank No. 4. This embraces 100 questions, which cover all of the previous instruction work, and are intended to test the fitness of the applicant. These questions are put to the students in classes and not individually, it being thought that in the course of random questioning the instructor will be able to subject each student to at least thirty of the questions, and in all probability more. This blank receives the signatures of both the chief instructor and the applicant, and is also kept on file by the company, furnishing a permanent record of the student's knowledge upon the various points.

Blanks Nos. 5 and 6 refer to the instruction of conductors, comparing very closely in detail with the instruction conveyed in blanks Nos. 2 and 4 for the motormen. Blank No. 5 provides for practice work upon all lines from each depot under the supervision of a "boss conductor" and the examination by

7½M 11-1-4

FILE No.

Brooklyn Rapid Transit System

EMPLOYMENT DEPARTMENT

Instruction Blank, No. 4

.................................190

FINAL EXAMINATION

.... Student Motorman No. ....

R W 1. What are the bell signals?

R W 2. What is the first thing to do when you board car, preparing to go out?

R W 3 What is the proper operation in taking car from house?

R W 4. How many points are there on the controller?

R W 5 How do you start car?

R W 6. How do you take hold of control handle while operating car?

R W 7. How long do you keep your left hand on the control handle?

R W 8. How do you increase speed?

R W 9. What are the safe and economical running points?

R W 10. What is the danger of running on other points?

R W 11. What happens when the controller is operated too quickly?

R W 12. Why can the controller be operated more quickly when car is running at full speed, than at start when car is moving slowly?

R W 13. What is the danger of slow movement, or stopping of controller between the 5th and 6th notches,—series and multiple?

R W 14. How do you throw power off?

R W 15. Is it dangerous to throw power only partly off?

R W 16. When running with controller on full multiple, what is the only way to bring it to full series?

R W 17. When necessary to throw a little power on and off quickly, what are the best points to notch to and throw off from?

R W 18. What do you do with the brake before applying power?

R W 19. How do you keep your right hand on the brake?

R W 20. How do you make a full stop?

R W 21. How long do you keep your right hand on the brake?

R W 22. How do you reverse car?

R W 23. If trolley should leave wire while car is in motion, what would you do?

R W 24. Are all cars equipped with circuit breakers?

R W 25. What should you do with circuit breaker, when changing ends?

R W 26 If overhead circuit breaker on car should release while car is in motion, what would you do?

27. If circuit breaker releases again, while operating controller slowly, what would you do?

R W *A.* If controller is in series?

R W *B.* If controller is in multiple?

R W 28. How do you cut out No. 1 motor?

R W 29. If circuit breaker releases after cutting out No. 1 motor, what would you do?

R W 30. If circuit breaker releases fter cutting out No. 2 motor what would you do?

R W 31. Is there ever any excuse for motorman holding in circuit breaker?

R W 32 In what part of the car is the fuse box located?

R W 33. What is the fuse box for?

R W 34 How do you put in a new fuse?

R W 35. Where are the spare fuses kept?

R W 36. What inspection must you give car before taking it out?

R W 37. What is the rule about operating car from rear end?

R W 38. How far would you back car, without changing ends?

R W 39. Is it ever proper to start car, without bells from conductor?

R W 40. How do you operate when passing intersecting streets?

R W 41. Give exception to this rule, by stating what is proper operation at "Stop" streets, and also what is the rule about "School" stops?

R W 42. What are the rules about operating on schedule?

R W 43. Give time and transfer points on your line?

R W 44 How do you stop car?

R W 45. How do you start and operate car on down grade?

R W 46. What is "skidding wheels," when is it likely to happen, and why should you avoid it?

R W 47. What is the rule about operating car, when its condition, or that of the rail, makes it hard to stop?

R W 48. When is it proper to use sand?

R W 49. What is the rule about looking ahead, or talking with passengers?

R W 50. What is the rule about approaching wagons or other vehicles?

R W 51. What is the rule about approaching pedestrians or children?

R W 52. What is the rule about passing other cars, wagons, or obstructions on the street?

R W 53. Where should two cars never pass each other?

R W 54 What are semaphore signals?

R W 55. Where are such signals used?

R W 56. What does red light mean?

R W 57. What does green light mean?

R W 58 What does white light in place of red or green mean?

R W 59. When semaphore arm of blade extends straight out, horizontally, what does it mean?

R W 60. When dropped, what does it mean?

R W 61. Where is semaphore signal with 2 blades used?

R W 62. Which movement does each blade cover?

R W 63 How should all steam railroad crossings be passed?

R W 64 When operating open car, what rule should be followed about approaching wagons or other obstructions?

R W 65. How do you operate over facing point switches, and all special work?

R W 66 What rule do you follow when you see or hear a fire engine on the street?

R W 67. What is the rule in regard to stopping for passengers?

R W 68. What is the rule in regard to spacing of cars?

R W 69. What is the rule about operating car through water?

R W 70 What special rule governs operation through dark places, or in foggy weather?

R W 71 What is the 100 foot rule, governing operation at street railway crossings?

R W 72. What indicates the street which has right of way at crossing?

R W 73. Who has charge of car?

R W 74. Who may operate your car, while you are on duty?

R W 75. What is the rule about talking while on duty?

R W 76. Who may ride on front platform?

R W 77. What are the rules about closing gates, and adjusting chains and side bars?

R W 78. What are the rules in regard to accidents, and making reports of them?

R W 79. What are the rules in regard to ejectments?

R W 80. Name all the bell signals which you may give to the conductor, and explain each.

R W 81. Explain gong signals?

R W 82. What are the proper stopping places for discharging and receiving passengers?

R W 83. Where should rear platform be, when car is stopped for passengers?

R W 84. What is a regular stop? Name several.

R W 85. What is the rule in regard to wrong track movement?

R W 86. What is the rule about backing cars?

R W 87. What is the rule about waiting for passengers?

R W 88. What would you do, if you found a broken trolley wire?

R W 89. If control becomes disabled, when car is in motion, what would you do?

R W 90. If the car becomes electrically charged, what would you do?

R W 91 If you are unable to move car what would you do?

R W 92 If your car is being pushed by another, what signals would be used, what would your position be, and what would you do?

R W 93. What should you do when current is off line, and when would you start?

R W 94 When disabled car is being pushed or pulled, what should you do with circuit breaker?

R W 95. How would you leave car after pulling in?

R W 96. When stopping at near side of street, where must you stop?

R W 97. What is the rule about filling sand box?

R W 98. What is the rule about reporting condition of car on shop sheet?

R W 99. Show, how a lamp or flag should be thrown, to mean—stop? To mean—go-ahead? To mean—back?

R W 100. What would you do with operating handles, when leaving car?

SUPERINTENDENT EMPLOYMENT AND INSPECTION:—

I hereby certify, that I have examined applicant whose signature is hereto appended, find him competent, and recommend his appointment as motorman.

.... *Chief Instructor.*

Dated 19

Applicant's Signature

....

FIRST AND SECOND PAGES OF INSTRUCTION BLANK NO. 4

Brooklyn Rapid Transit System

EMPLOYMENT DEPARTMENT

Instruction Blank No. 5.

FILE No. ....

.... 190

Division Superintendent,

.... Depot

.... Badge No. .... has been appointed Conductor and assigned to above named depot. We are now investigating his references and giving his application consideration, pending which you will give him the regular course of training, with the understanding that he will receive no pay for same, and that the right is reserved to terminate such instruction and refuse to accept his services at any time.

....
Supt of Employment and Inspection.

Questions on this blank are to assist conductors in giving proper instruction to students. All instructing conductors must see that students thoroughly understand the operation of cars in accordance with the Rules and Regulations of this Company, and are fully acquainted with all conditions, a knowledge of which is necessary for proper operation over their particular lines.

R W 1 What inspection of car must be made before starting from depot? Rule 96.

R W 2 When must motorman's name be secured, and where should it be entered? Rule 97

R W 3. Who has charge of car? Rule 36.

R W 4. What is the rule about talking while on duty? Rule 40.

R W 5 What is the rule about gates and side bars? Rule 45.

R W 6. When you give one bell to the motorman, what does it mean? Rule 63.

R W 7. When you give two bells, what does it mean? Rule 63.

R W 8. When you give three bells while the car is moving, what does it mean? Rule 63.

R W 9 When you give three bells while the car is standing, what does it mean? Rule 63

R W 10. When the motorman gives you one bell, what does it mean? Rule 64.

R W 11 When the motorman gives you two bells, what does it mean? Rule 64

R W 12. When the motorman gives you three bells, what does it mean? Rule 64.

R W 13. When the motorman gives you three bells while the car is moving, what does it mean, and how is this signal answered? Rule 64.

R W 14 When the motorman gives you four bells, what does it mean? Rule 64.

R W 15. When the motorman gives you five bells, what does it mean? Rule 64

R W 16. When the motorman gives you one or more bells immediately after starting car, when he may have been receiving passengers, what does it mean? Rule 65.

R W 17. When the motorman gives one tap of gong while car is standing, what does it mean? Rule 66.

R W 18. When the motorman gives two taps of gong while car is standing, what does it mean? Rule 66.

R W 19. Where should conductors stand when not collecting fares? Rule 119.

R W 20. What attention must be given passengers who wish to board or alight? Rule 120.

R W 21 When may starting bells be given? Rule 121

R W 22. What is the rule about calling streets and transfer points? Rule 123.

R W 23. What is the rule about announcing destination, when leaving terminals? Rule 124.

R W 24. What is the rule about giving starting bell from inside of car? Rule 125.

R W 25. Have passengers the right to ring bell? Rule 129.

R W 26. What are the rules about passengers riding on bumpers, running boards, etc.? Rule 126.

R W 27 When passengers alighting are in danger from teams or other cars, what should be done? Rule 130.

R W 28. What explanation should be given passengers on "pull in" trips? Rule 132.

R W 29. What is the rate of fare?

R W 30. How and when should fares be collected? Rule 102.

R W 31 What are the instructions regarding the collection of fares from children under six years of age?

R W 32. How should fares be registered? Rule 103.

R W 33. What effort should be made to collect fares from passengers who board the car while conductor is inside, and is unable to distinguish them? Rule 104.

R W 34. How and when should the register be set? Rule 105.

R W 35. How is the register card used? Rule 107.

R W 36. What is the rule in regard to registering fares and issuing transfers on relief trips? Rule 107.

R W 37. What should be done with the register when laying up cars? Rule 109

R W 38. How should day cards and trip envelopes be made up, and what time should be noted thereon? Rule 110.

R W 39. When should transfers be punched A. M. and when P. M? Rule 113.

R W 40. When and how should collections be turned in? Rule 111.

R W 41 How should transfers be issued? Rule 112.

R W 42. What should be done with mutilated transfers? Rule 114.

R W 43. How should transfers be deposited after collection? Rule 115.

R W 44. When should street and transfer points be announced? Rule 117–123.

R W 45 What is the rule about pulling down trolley at end of line, after dark? Rule 131

R W 46. What is the rule about tail lights? Rule 133.

R W 47. What is the rule about rear head lights? Rule 134.

R W 48. What is an accident, when and how is it reported? Rule 51.

R W 49. Name the class of accidents in which the names and addresses of all passengers must be procured? Rule 52.

R W 50 What method is to be pursued in obtaining names and addresses of witnesses? Rule 54.

R W 51 For what reason, under what conditions, and where may passengers be ejected from cars? Rule 58–62.

R W 52. What is the rule about regular stops? Rule 69.

R W 53. When must car be stopped at far crossing? Rule 70.

R W 54. Where should conductor stand and what should he do when car is backed? Rule 73.

R W 55. What time should car leave terminal? Rule 74.

R W 56. Should car be held for passengers at transfer points? Rule 75.

R W 57. What rule is to be followed at steam and elevated crossings? Rule 89.

R W 58. What is the rule about leaving switches not usually used? Rule 91.

R W 59 Who are free riders, and what shows that they are entitled to ride? Rule 98.

R W 60 What is the rule about securing passengers seats? Rule 101.

R W 61. What should be done when leaving car, after pulling in at Depot? Rule 93.

R W 62. What attention must be given to cleanliness of cars while on the road? Rule 135.

We have instructed .... Badge No. ....
and believe him to be thoroughly competent.

DATE	LINE	NO. TRIPS	SIGNATURE OF INSTRUC CONDUC.	BADGE NO.

I have instructed student on all questions, 1 to 62, have examined him on same, and find him competent.

....
Boss Conductor.

I have received instruction from all conductors whose names appear above, covering all points covered by questions No. 1 to 62, and also have been examined on same by Boss Conductor.

Dated .... 190 ....

FIRST AND SECOND PAGES OF INSTRUCTION BLANK NO. 5

him of a list of sixty-two questions, supplemented by thirty-one questions by the depot master. The candidates for the position of conductor are given their instruction, as with the motormen, by trained employees, and only report to the "boss" conductor after they have been reported as satisfactory by their instructors. Blank No. 6 is a final examination, covering ninety-three questions, which are also put to the conductors in classes by the chief instructor, it being considered adequate to secure answers to a third or half of the questions from each student.

Blank No. 7, which completes the series, covers the probationary work of each student motorman. It is the practice in Brooklyn to assign each successful applicant for position as motorman to six days probationary work at a nominal rate of pay of $1 per day, during which time a competent motorman is sent out with the student to act as inspector. The inspecting motorman records upon this blank the lines operated over, the time, etc., and also any errors of the student in operation. This record is also retained, and with the others forms a valuable check upon the instruction that has been given.

To sum up, the purposes aimed at in the system were to secure the following:

1. Thorough and uniform instruction.
2. Simple and practical instruction which a "green" man can grasp.
3. Least cost in educating a great number.
4. Education to be accomplished within the least possible time, thus reducing the hardship upon the men.
5. Logical and systematic instruction.

The following questions are to assist Depot Masters in instructing and examining students, who have been turned in as satisfactory after the regular course with instructing conductors. In addition to the questions herein set forth, students must be examined as to all other important information.

R W 63. What is the rule about personal appearance? Rule 34.

R W 64. What is the rule about intoxicating liquors? Rule 6.

R W 65. What is the rule about gambling? Rule 7.

R W 66. What is the rule about smoking? Rule 8.

R W 67. What time should you report for duty? D. R.

R W 68. What does the "excused list" mean? D. R.

R W 69. What does "jump" mean? D. R.

R W 70. What is the rule about being excused? D. R.

R W 71. What should you secure from starter or clerk, before taking car from depot? Rule 95.

R W 72. How much change should you carry? Rule 95.

R W 73. When working as "extra" who will assign you to work? D. R.

R W 74. Who will designate your car? D. R.

R W 75. What record do you make before taking car out? Rule 97.

R W 76. What record do you make before pulling in car?

R W 77. How are reliefs to be made on the line? Rule 108.

R W 78. Name consecutively all transfer points on any two lines?

R W 79. Name five important cross streets on any two lines?

R W 80. Name five important points of interest on any two lines?

R W 81 If short of transfers, what may you do? Rule 116.

R W 82. If for any reason passengers are transferred from one car to another, what is the rule? Rule 118.

R W 83. What is the rule in regard to intoxicated persons boarding cars? Rule 122.

R W 84. What attention must you give to destination signs, and what rule is to be followed if car becomes disabled? Rule 79.

R W 85. What rule is to be followed if car becomes electrically charged? Rule 80.

R W 86. How may disabled cars be taken to depot? Rule 81.

R W 87. What signals should be used when pushing disabled cars? Rule 83.

R W 88. What should be done with trolley on disabled cars? Rule 77.

R W 89. What is the rule about time-table change or new table? Rule 94.

R W 90. What is the rule about dogs? Rule 100.

R W 91. What is the rule about bundles, or soiled clothing being carried on car? Rule 136.

R W 92. What is the rule about lost articles? Rule 137.

R W 93. What is the rule about papers and other things being sold on cars? Rule 138.

I certify, that I have examined student whose signature is hereto appended on questions No. 63 to 93, find him competent and recommend his appointment as Conductor.

....
Depot Master.

Dated 190

....
Student.

THIRD PAGE OF INSTRUCTION BLANK NO. 5

7¼M. 11-1-6.

Brooklyn Rapid Transit System

EMPLOYMENT DEPARTMENT

Instruction Blank No. 6.

FILE No.

.190

FINAL EXAMINATION

. STUDENT CONDUCTOR. BADGE No.

ANSWER

R W 1. What inspection of car must be made before starting from depot?

R W 2. When must motorman's name be secured, and where should it be entered?

R W 3. Who has charge of car?

R W 4. What is the rule about talking while on duty?

R W 5. What is the rule about gates and side bars?

R W 6. When you give one bell to the motorman, what does it mean?

R W 7. When you give two bells, what does it mean?

R W 8. When you give three bells while the car is moving, what does it mean?

R W 9. When you give three bells while the car is standing, what does it mean?

R W 10. When the motorman gives you one bell, what does it mean?

R W 11 When the motorman gives you two bells, what does it mean?

R W 12. When the motorman gives you three bells, what does it mean?

R W 13. When the motorman gives you three bells while the car is moving, what does it mean, and how is this signal answered?

R W 14 When the motorman gives you four bells, what does it mean?

R W 15. When the motorman gives you five bells, what does it mean?

R W 16. When the motorman gives you one or more bells immediately after starting car, when he may have been receiving passengers, what does it mean?

R W 17. When the motorman gives one tap of gong while car is standing, what does it mean?

R W 18. When the motorman gives two taps of gong while car is standing, what does it mean?

R W 19. Where should conductors stand when not collecting fares?

R W 20. What attention must be given passengers who wish to board or alight?

R W 21. When may starting bells be given?

R W 22. What is the rule about announcing streets and transfer points?

R W 23. What is the rule about announcing destination, when leaving terminals?

ANSWER

R W 24 What is the rule about giving starting bell from inside of car?

R W 25 Have passengers the right to ring bell?

R W 26. What are the rules about passengers riding on bumpers, running boards, etc.?

R W 27 When passengers alighting are in danger from teams or other cars, what should be done?

R W 28. What explanation should be given passengers on "pull in" trips?

R W 29. What is the rate of fare?

R W 30. How and when should fares be collected?

R W 31 What are the instructions regarding the collection of fares from children under six years of age?

R W 32. How should fares be registered?

R W 33. What effort should be made to collect fares from passengers who board the car while conductor is inside, and is unable to distinguish them?

R W 34 How and when should the register be set?

R W 35. How is the register card used?

R W 36. What is the rule in regard to registering fares and issuing transfers on relief trips?

R W 37. What should be done with the register when laying up cars?

R W 38. How should day cards and trip envelopes be made up, and what time should be noted thereon?

R W 39. When should transfers be punched A. M. and when P. M?

R W 40. When and how should collections be turned in?

R W 41. How should transfers be issued?

R W 42. What should be done with mutilated transfers?

R W 43. How should transfers be deposited after collection?

R W 44. When should street and transfer points be announced?

R W 45. What is the rule about pulling down trolley at end of line, after dark?

R W 46. What is the rule about tail lights?

R W 47. What is the rule about rear head lights?

ANSWER

R W 48. What is an accident, when and how is it reported?

R W 49 Name the class of accidents in which the names and addresses of all passengers must be procured?

R W 50. What method is to be pursued in obtaining names and addresses of witnesses?

R W 51. For what reason, under what conditions, and where may passengers be ejected from cars?

R W 52. What is the rule about regular stops?

R W 53. When must car be stopped at far crossing?

R W 54. Where should conductor stand and what should be do when car is backed?

R W 55. What time should car leave terminal?

R W 56. Should car be held for passengers at transfer points?

R W 57. What rule is to be followed at steam and elevated crossings?

R W 58. What is the rule about leaving switches not usually used?

R W 59 Who are free riders, and what shows that they are entitled to ride?

R W 60. What is the rule about securing passengers seats?

R W 61 What should be done when leaving car, after pulling in at depot?

R W 62 What attention must be given to cleanliness of cars while on the road?

R W 63 What is the rule about personal appearance?

R W 64 What is the rule about intoxicating liquors?

R W 65. What is the rule about gambling?

R W 66. What is the rule about smoking?

R W 67 At what time should you report for duty?

R W 68 What does the "excused list" mean?

R W 69. What does "jump" mean?

R W 70. What is the rule about being excused?

R W 71 What should you secure from starter or clerk, before taking car from depot?

ANSWER

R W 72. How much change should you carry?

R W 73. When working as "extra," who will assign you to work?

R W 74 Who will designate your car?

R W 75. What record do you make before taking car out?

R W 76 What record do you make when pulling in car?

R W 77. How are reliefs to be made on the line?

R W 78. Name consecutively all transfer points on any two lines.

R W 79. Name five important cross streets on any two lines.

R W 80. Name five important points of interest on any two lines.

R W 81. If short of transfers, what may you do?

R W 82. If for any reason passengers are transferred from one car to another, what is the rule?

R W 83. What is the rule in regard to intoxicated persons boarding cars?

R W 84 What attention must you give to destination signs, and what rule is to be followed if car becomes disabled?

R W 85. What rule is to be followed if car becomes electrically charged?

R W 86. How may disabled cars be taken to depot?

R W 87. What signals should be used when pushing disabled cars?

R W 88. What should be done with trolley on disabled cars?

R W 89. What is the rule about time-table change or new table?

R W 90. What is the rule about dogs?

R W 91. What is the rule about bundles, or soiled clothing being carried on car?

R W 92 What is the rule about lost articles?

R W 93. What is the rule about papers and other things being sold on cars?

FIRST AND SECOND PAGES OF INSTRUCTION BLANK NO. 6

6. A complete record of the instruction given to each employee.

I hereby certify that I have examined applicant whose signature is hereto appended and find him competent and recommend his appointment as Conductor.

Chief Instructor

Dated ,190

Applicant's Signature

CERTIFICATION AT FOOT OF BLANK NO. 6

Brooklyn Rapid Transit System

EMPLOYMENT DEPARTMENT

Instruction Blank No. 7.

FILE No.

190

Division Superintendent,

Depot.

The bearer .. No having passed the required examinations, has been appointed motorman You will assign him six days probation work with competent motormen who will act as inspectors. During this period the bearer will be paid at the rate of one dollar per day.

Report of his work during the above period is to be recorded in the spaces below, and at the end of probation this blank is to be returned to the Employment Department.

Any error which he may make in his operation of cars or otherwise will be recorded upon this blank, and will also be treated in accordance with the established rules of discipline.

Supt. Employment and Inspection.

DATE	LINE	TOTAL TIME		REMARKS	INSPECTING MOTORMEN	
		FROM	TO		NAME	BADGE No.

I hereby certify that the above is correct

Depot Starter

Approved 190

Division Supt

INSTRUCTION BLANK NO. 7

7. A method of inducing the men to study the rule book.

This school system has been worked out and perfected by the operating department of the company, under the direction of George R. Folds, assistant to the general manager. The electric sign apparatus for demonstrating the controller was designed by Mr. Folds, and was worked out, under his directions, by the electrical department. Acknowledgement is due the Brooklyn "Daily Eagle" for the photographs of the school equipment.

The Dayton & Troy Electric Railway has inaugurated a novel contest to secure suggestions from the public for the betterment of its limited service and incidentally to secure a name for a new parlor car to be installed. All persons holding excess fare receipts issued on limited trains will be privileged to suggest a name for the car and for other innovations deemed desirable in connection with the service. The person making the best suggestion will receive a 1000-mile mileage book good on any train on the road. The new parlor library car will be installed about May 30, making three of these cars in service between Dayton and Lima.

THE STEEL WHEEL FOR STREET RAILWAY SERVICE

BY GEORGE L. FOWLER

For some time past there has been a growing conviction among street railway men that possibly the cast-iron wheel is not the one from which the very best and most economical service can be obtained. That it is and undoubtedly always will be the lowest in first cost must be at once acknowledged, but in this, as in many other matters, low first cost is not always indicative of lowest actual cost. In addition to this, it is generally conceded that frequently the case arises where it is economical to pay a little extra for an article because of the additional safety or convenience that is thereby obtained. It is because of these outside influences, as it were, that it is so difficult to determine the true value of an innovation as great as that of the introduction of the steel for cast-iron wheels in street railway service would be.

The opinion that was prevalent a year or two ago was that, inasmuch as the wear of wheels under street cars was due to the friction of the brakes more than the rolling upon the rails, the wear of a steel-tired wheel would be so rapid that the mileage obtained would be far less than that on the steam roads, and that it would not be much if any greater than that of the cast-iron wheel. With this the generally accepted opinion on the subject, the railway companies were not inclined to buy and the manufacturers had no data with which to urge the purchase of the steel wheel.

As interurban roads came to be built, and comparatively high speeds were attained with heavy cars, it was recognized by the management that the low thin flange, necessary for traffic on the city streets, was hardly strong enough to resist the stresses imposed in the open country. Hence, as a safety precaution, steel-tired wheels were put under these heavy cars.

The success attending their employment, the service that they evidently did render on city streets, their freedom from flat spots and their ability to keep a car in operation for long periods, led to the suspicion that possibly their use might be extended to the purely urban work, and wherever this has been done the results have been more than satisfactory and have added to the golden opinions which the same type of wheel had won in other directions.

In the matter of the first cost, the steel wheel is, of course, the most expensive; in fact, it costs about three times as much as the one of cast iron. But to consider the other items that are factors in the ultimate value of the wheel, causes the subject to appear in a different light.

The point that invariably receives the first consideration in connection with the cost is mileage. Cast-iron wheels are frequently bought under a guarantee of life of 40,000 miles, but owing to variables that so affect the life of the wheel, such as slid-flat spots and the like, whereby the manufacturer is released from his guarantee, the actual life does not average much above 30,000 miles. Further, the guarantee is sometimes, perhaps even on the majority of roads, immediately lost to sight, because of the total lack of all mileage records that obtains in so many places. At any rate, 30,000 miles is a good high average.

Again, during this period the car may have to be sent to the shop on more than one occasion for the truing of wheels, or the remedying of some defect that belongs solely to them. As a consequence the cost per 1000 miles in the use of a cast-iron wheel involves not only the first cost, but the truing and the value of the service of the car which is lost while out of use waiting for the wheel repairs to be effected.

It is still too early to predict exactly what service will and can be rendered by a steel wheel in city service. Experience, however, seems to indicate that it will be more than sufficient to pay for the extra first cost. As in all the other affairs of life, experiences even along parallel lines differ, but the composition of some of these experiences may tend to point to a resultant that may be classed as that of a reasonable expectation.

In one case where steel wheels were used on a service of combined city and interurban traffic, the whole lot in use were removed from the cars on account of flange wear. They were turned down, and by taking the mileage obtained in connection with the amount of metal removed, it appears that three to four turnings will be obtained per wheel, and this would give an average life of about 110,000 miles, when the wear of the whole is taken into consideration. The general manager upon whose road this test was made, in commenting on the subject, writes that "the wheels should run in the vicinity of from 150,000 miles to 200,000 miles, particularly if watched and turned down before they have worn so far that they cannot be turned." Other investigations lead to the belief that 200,000 miles is much more than will probably be obtained from any steel wheel that will be made for city service, and that 150,000 miles is what might be called a good high average, although by no means unattainable.

Again, a road with a heavy traffic and small storage space in its barns equipped two of its lines with steel-tired wheels, with the view of obtaining a greater freedom from wheel troubles and delays. These wheels have now been in use for about eight months, and in all that time not a single car has been hauled in or laid off for wheel defects of any kind. This one item of freedom from loss of car service is sufficient in itself, in the opinion of the management, to compensate for any increase of expense involved in the extra cost of the wheel. In this case, however, it does not seem probable that there will be any extra expense, but rather a decided saving. The average mileage of the cars under consideration is about 2000 miles a month, and the wear is going on at the approximate rate of 1-16 in. per 5000 miles. With a tread that is capable of 1¾ ins. of wear, the life of the wheel would be about 140,000 miles. This latter figure is, of course, only an estimate, as no steel wheels have as yet been worn out in street railway service. In this connection the accompanying Fig. 1 will be of interest as indicative of the character of the wear. The sketch is an accurate reproduction of the contour of a wearing tire, and shows a remarkable uniformity over the whole surface of the tread and flange, from which it seems safe to infer that the whole wheel may be worn out without necessitating the removal of the wheels for turning. Indeed in some cases that have been investigated, wheels have run for more than 100,000 miles with an evenness of wear that indicates that no turning will be required throughout the whole life of the wheel. Fig. 2 shows such a contour taken from a wheel that had been reduced 2 ins. in diameter, or 1 in. on the tread by wear from which the uniformity of the loss of material can be clearly seen.

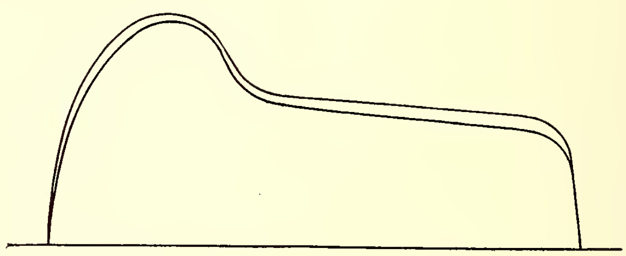


FIG. 1.—DIAGRAM SHOWING WEAR OF STEEL-TIRED WHEEL

If a comparison be made between the known or even the guaranteed mileage of the cast-iron wheel and a low conservative estimate of the probable mileage of the steel wheel, we have 30,000 miles or 40,000 miles for the one and at least 125,000 for the other, or at the rate of from 4.16 and 3.125 to one, according to the basis of the estimate. In either case the purchasing road would be fully warranted in paying somewhat more than three times the first cost of the cast-iron wheel for the steel one, even though it chose to entirely neglect the advantages accruing from the freedom from wheel renewals, safety of operation and continuous and uninterrupted car service.

So much for the probable advantages of using a steel wheel. As to the type of wheel, the same principle should hold in this that is applied to other departments of mechanics. If a wheel can be made of a homogeneous material throughout its whole extent, it is to be preferred to one composed of different materials. The difficulty has been to so manipulate a steel casting that the amount of work can be put upon it which is needed to bring it to the proper physical condition throughout the whole mass to withstand the wear to which it will be subjected.

Among the workers in this line who have persisted in the development of such a wheel is Charles T. Schoen, who has at last succeeded in producing one that, so far as the chemical and physical requirements of the laboratory and the road are concerned, meets them all with a margin to spare. The wheel is formed from a steel slab that has already had some work done upon it in the slabbing mill, so that it possesses an advantage at the start over a simple steel casting. The process to which it is subjected in the special machinery that has been designed for the purpose consists of a combined forging and rolling. The forging is done under hydraulic presses, and the rolling in an elaborate machine of great power and range of operation.

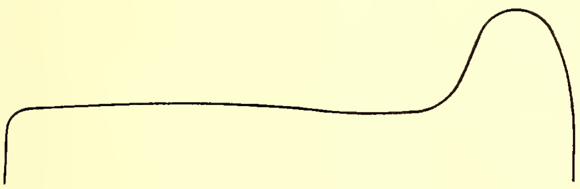


FIG. 2.—CONTOUR OF STEEL-TIRED WHEEL WHICH HAS WORN DOWN 2 INS. IN DIAMETER

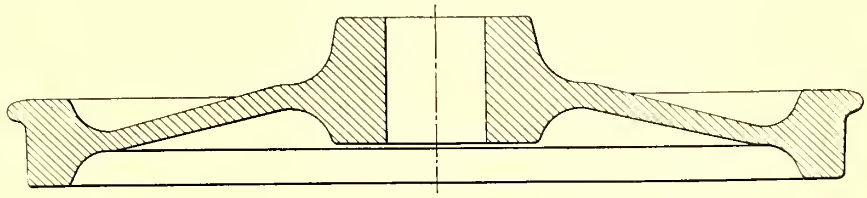


FIG. 3.—SECTION OF ROLLED STEEL WHEEL

Recent tests as to the characteristics of the metal of this wheel show that in chemical composition it contains .72 per cent carbon, which is about .10 per cent more than that put into the ordinary tire, while it contains less phosphorus, sulphur and silicon, but more manganese. As would be expected from this composition, the tensile strength is high, running from 125,000 lbs. to 134,000 lbs. per square inch of section. The elongation averages about 12 per cent and the hardness is well above that of the common tire. When tested with a Rodman punch, by which the hardness is considered to be proportional to the amount of metal displaced by the punch falling under the impulse of a given weight from a given height, it has been found to be nearly 17 per cent harder than the tire already referred to.

With these physical characteristics and the record of successful service on steam roads behind it, the matter of extensive use on electric roads is merely a matter of time.

Reverting to the process of manufacture, the blanks, as they come to the mill, are nearly square, just as they have been cut off on leaving the slabbing mill. They are first heated and then placed beneath the hydraulic forging press that has a capacity of 10,000,000 lbs. Here the hub is formed, the web just outside of it brought down to an approximate thickness, and the rim afterward sheared off by a circular punch whose diameter is equal to the dimensions it is desired the blank should have as it passes the rolling mill. Before going to the latter, the blank is at present reheated.

The rolling mill itself is designed for the formation of the rim. It is driven by a pair of steam engines having cylinders 22 ins. in diameter, with a piston stroke of 36 ins. In this machine the blank is subjected to the action of the five rolls. One bears directly against the tread and flange and shapes the same; two bear against the side of the rim and roll it to the proper width, while the last two are forced against the web and the under side of the rim with a pressure of about 250 tons, and, rotating the whole between them, roll the web down to the proper thickness, which varies with the diameter of the wheel and the purposes for which it is intended. The diameter of the rim as it enters the machine is thus increased as the metal composing it is drawn out. This rolling process occupies about three minutes, and when the wheel is taken out it is of a light cherry color and is carried to a second hydraulic press, where the hub is pressed down and the proper dish given to the web. When the work is completed, at the end of about five minutes from the time it left the furnace, the wheel is of a bright cherry red and of the shape shown in Fig. 3.

The process leaves the metal not only in a compact homogeneous mass throughout, as denoted by the physical tests referred to, but the wheel itself is round and true. There will not be a variation of more than 1-32 in. in diameters of wheels of the same nominal size, which is well within the limits of ordinary turning, and much less than we are accustomed to look for in those of cast iron.

It would seem then that, with the experience of the railroads in actual operation as a guide and a wheel of this character available, the introduction of the steel wheel into street railway service should be both rapid and extensive.

THE PROPOSED YOSEMITE ELECTRIC RAILWAY

There has been filed with the County Clerk at Stockton, Cal., a map showing the route for a projected electric railway from Stockton to the Yosemite Valley. Through Tuolumne County all the rights have been obtained, and also from Stockton out a considerable way. In Calveras County a large portion of the route has been obtained. Between Linden and Stockton provision is made for a belt line, and it is evidently the company's intention to do a great deal of business in the handling of fruit and other products of the region to the east and northeast of Stockton. The road is to start on the north bank of McLeod's Lake, in the city limits, going out the western edge of the town, after which it will turn north, passing Lodi, then on through Waterloo, crossing the Calaveras River a mile below Bellota; thence to Jenny Lind and Copperopolis, crossing the Stanislaus River 2 miles or 3 miles below the ferry on to Tuttletown and a mile beyond, after which the road will take a southerly direction, skirting the western edge of Jamestown and continuing southerly to and across the Sierra Railroad, 2 miles southwest of Jamestown; thence in a general southern course along the west side of Woods Creek, passing half a mile east of Chinese Camp. The road will then follow the same general course to and across the Tuolumne River at the bend just below Jacksonville; thence in the same direction 3 miles, where it turns north across the Moccasin Creek and strikes the south side of the Tuolumne River, which it follows to a point three miles or more north of Groveland, finally reaching the National Park boundary at a point 12 miles or 13 miles from the hotel in the valley.

REVIEW OF STREET RAILWAY LEGISLATION IN MASSACHUSETTS DURING THE LAST SESSION

The session of the Massachusetts Legislature which has just closed was most remarkable in the number of important measures which, by a narrow margin of votes, were referred to the next General Court. At the opening of the session there was every indication that legislation of great interest to street railway operators and investors would be put through, but the failure of the larger street railway systems to agree upon the form which this legislation should take, and the active opposition of the steam railroad systems to certain of the measures which were introduced, were responsible for their defeat.

Perhaps the most important action taken, so far as the street railways are concerned, was the passage of a resolution for the appointment of a Joint Special Legislative Committee to sit during the recess and consider the revision of the laws governing railroads and street railways. This committee will meet shortly for organization and will then probably adjourn until the early part of September, when its active work will begin. Its personnel was selected by the President of the Senate and the Speaker of the House with very evident care, the committee consisting of President Dana, of the Senate; Senator Cummings, chairman of the Committee on Street Railways; Senator Monroe, chairman of the Committee on Railroads; Senator Peters, of the Judiciary Committee; House Chairmen Taft, of Judiciary; Pingree, of Street Railways, and Hayes, of Railroads, and Messrs. Cole, of Public Lighting; Schofield, of Labor; Lowell and Davis, of Judiciary; Andrews, of Ways and Means; Peabody, of Metropolitan Affairs; Ames, of Judiciary, and Mooney, of Taxation. It will be noticed that the Committees on Railroad and Street Railways are each represented on the special committee by their Senate and House chairmen, the balance of the committee being made up of the strongest members of each branch. From the make-up of the committee it is a fair presumption that any recommendations for legislation which it may make will be adopted by the next General Court.

One of the greatest contests of the session just closed came on the bill to permit railroads chartered in Massachusetts to acquire the stock and property of Massachusetts street railways. Last year the Boston & Maine Railroad petitioned for legislation of this sort, but the influence of competing steam railroad companies was responsible for its demise. The bill reported by the Committee on Railroads this session was based upon the recommendation of the Railroad Commission, but the committee had stricken from it the provision giving the Railroad Commission authority to supervise and approve the price at which street railway stock might be taken over by the purchasing railroad. This provision was restored by the House, but the Senate refused to concur, and the bill finally died between the two branches because of the inability of various conference committees to agree upon any compromise.

In the course of the contest over this bill, however, several orders were adopted requesting the opinion of the Attorney-General as to the right of a corporation chartered under both the laws of Massachusetts and of another State to purchase street railway stock, and also asking information of the Railroad Commission as to the amount of stock of Massachusetts street railways which was held by the New York, New Haven & Hartford Railroad. The reply of the Attorney-General was, in effect, that a foreign corporation which also held a Massachusetts charter could be proceeded against if it violated the laws of this State by holding street railway stock. The Railroad Commissioners forwarded communications from President Mellen, of the New Haven Road, to the effect that the latter road held stock of street railways in Berkshire and Springfield, and also of other roads which are partly in this State. These communication had their effect in securing the defeat of the merger bill, as many members urged that there was no necessity for extending the power of the Boston & Maine Railroad in this matter if the New Haven Road could be restrained from purchasing other street railways and made to give up its holdings in the roads which it already controlled.

Under the laws, the initiative in taking action against a railroad corporation which has violated the laws in this manner is left to the Railroad Commission, provision being made that a communication shall first be sent to the corporation calling attention to the violation, and if this is not heeded, information of the alleged violation shall be lodged with the Attorney-General for action. No such action has yet been taken by the board, nor is it likely to be unless the road complained of undertakes to extend its street railway holdings.

The demand for a high-speed interurban railway between Boston and Providence led to the introduction of several petitions for special charters with authority to construct such a line. Each one of the accompanying bills provided that the proposed incorporators should be given the exclusive right to take land by eminent domain and operate thereon. So far as these special petitions were concerned, the contest finally narrowed down to one between the Shaw-Gaston interests, which now control the Boston Elevated system and the Boston & Worcester Road, and the Stone & Webster interests, the latter controlling the Blue Hills Street Railway Company, which already covers some 15 miles of the proposed route.

The Committee on Street Railways finally split on the proposition, eight of the fifteen members, under the leadership of Senate Chairman Cummings, agreeing to report a general bill authorizing street railways to take land by eminent domain and operate thereon, while the other seven, including House Chairman Pingree, favored the Shaw-Gaston special bill. By agreement, the Shaw-Gaston bill was substituted for the adverse report on one of the special petitions. Within a few days the interests behind the special bill succeeded in having the general bill killed in the House, but their own bill was defeated in retaliation by the Senate.

A bill which passed to be engrossed in both branches practically without debate was that providing that street railways in general could purchase or lease land and operate thereon. At the time this was engrossed there seemed to be no objection to it from any quarter, but the Gaston-Shaw interests realized, as soon as their special bill was rejected, that this bill would give the Blue Hills Street Railway a chance to construct its line to Providence over private land before the next session of the Legislature, and they accordingly secured the defeat of this general bill also when it was on its enactment stage in the Senate, a most unusual action for the Massachusetts Legislature. A general eminent domain law for street railways will undoubtedly be considered at length by the special committee during its sessions.

The long fight which has been made to secure a through line between Haverhill and Boston, by which the New Hampshire lines, controlled by the New Hampshire Traction Company, would get an entrance to the latter city, was again brought before the Legislature in the form of a petition for legislation to confirm locations already granted to the Haverhill & Boxford and the Maplewood & Danvers Street Railway companies. The question as to the validity of these locations was raised by the representatives of the Boston & Maine Railroad and of the Boston & Northern Street Railway Company, which have opposed the new line at every step. As the question is now pending before the courts, the Legislature refused to interfere, the petitioner being given leave to withdraw on recommendation of the Committee on Street Railways. If the decision of the court is in favor of the proposed line, the last apparent obstacle to the construction of the road will be removed, and its promoters claim that it can be completed and in operation in a comparatively short time.

There was the usual attempt this year to repeal the law requiring the approval of the Railroad Commissioners for locations granted by local boards, but this was killed with even less than the usual amount of debate.

An unusual bill which became a law was that authorizing the Old Colony Street Railway Company to sell electricity to an amusement enterprise for purposes of lighting and power. Taking this as a precedent, there will undoubtedly be many petitions for similar privileges at the next session. In this case, however, there were strong reasons for the legislation. The amusement enterprise in question had been built with an assurance from the local lighting company that it would be furnished with ample electricity for its purposes, but the lighting company was unable to carry out its agreement, and the enterprise would have been a failure had not the Legislature put through the measure to allow such purchase of the street railway company.

That some portions of the Massachusetts street railway laws are but survivals of horse car days was shown by the necessity for passing a bill to repeal that section of the law providing that a majority of the directors of a street railway company must be residents of the cities and towns in which the railway was located. It required little argument to convince the legislators that the conditions of street railway operation and ownership to-day make such a provision obsolete.

No legislation adverse to the interests of the street railways was passed, though there were the usual number of bills to regulate equipment, to provide for the adoption of various safety appliances, the carrying of lifting jacks, etc. The most largely attended hearing on a measure of this sort was on the petition to require the ventilation of street cars, but the petitioners in this case were also given leave to withdraw, as no two of them agreed on the proper method of securing such legislation, and they all allowed that the Railroad Commission already has sufficient power in the matter.

The law to prevent loitering in railroad stations was extended to cover also the stations of street railways.

The Legislature refused to renew the charter of the Boynton Bicycle Railway, whose charter to construct a road between Boston, Quincy and Fall River expired two years ago, and it seems as though this project is now definitely dead, so far as the Massachusetts Legislature is concerned.

Altogether, the legislative session could not have been so satisfactory to the street railway interests of the State in general as have been some of the more recent sessions which have gone before it, but the coming sessions of the special committee may be to their advantage, and undoubtedly will be if they can get together for the common good.

In the closing days of the session a most important measure was introduced and put through without opposition of any sort. This was the act authorizing the Boston Elevated Company to construct a four-track subway in Cambridge from the end of the West Boston Bridge to a point near Harvard Square, a distance of something more than 2 miles, provision also being made for several minor distance subways to connect lines which do not now pass through Harvard Square.

The act providing for the construction of the elevated road through Cambridge, which was accepted by that city in the first instance, gave the Boston Elevated Company a permanent franchise for its structure between the points mentioned. After the construction of the Boston subways, however, there was a very decided sentiment in Cambridge against an elevated road, and, as a result of many conferences, the subway bill was finally agreed upon by the city authorities and the representatives of the Elevated Company.

Provision is made in this latest subway bill to the end that the city of Cambridge may purchase the subway in twenty years after its completion upon payment of the original cost, with 8 per cent interest per year. It is not generally expected that the city will purchase on this basis, the company's ownership in the subway generally being looked upon as permanent.

A somewhat unusual provision of the bill was that permitting the company to lease a portion of the subway as a conduit for electric and other wires. No contest over this feature was made by the telegraph or telephone companies, though they have heretofore opposed most strenuously and successfully the efforts of the city of Cambridge to obtain legislative authority for the construction of conduits in practically the same location.

IMPROVEMENTS OF THE RHODE ISLAND COMPANY

A number of improvements were made by the Rhode Island Company to its system during the year. Among them, and unquestionably the most important, was the reconstruction of the lines in Pawtucket, Central Falls and the town of Lincoln, in which places has been completed the work of changing the old narrow gage lines to standard gage. The system in these cities was originally constructed in 1885, and has remained practically as first built up to the present. Even the old "coffee mill" rheostatic control was a "feature" of the equipment until recently. Improvements were not made before because of a peculiar public sentiment that governed in the places named. Naturally the company was not inclined to meet conditions so onerous as to preclude a return on the investment, and so waited until favorable grants were made.

The new rails that have been laid in Pawtucket and Central Falls are of the grooved type, and the heaviest pattern used for railway work in the country, weighing 104 lbs. per yard. The ties supporting the track are also larger than those formerly used, being practically as large as those used in steam railway construction. On Main Street and Broadway, in the city of Pawtucket, where formerly there was only a single track, double tracks have been laid, and new tracks have been laid on Prospect Street, Prairie Avenue and Brook Street, the latter extending out to the entrance of the new Daggett Park. A new line has also been built in Lonsdale Avenue from Mineral Spring Avenue to Main Street.

Other important track work by the Rhode Island Company has been the connection of the North Main Street tracks in the city of Providence, through Steeple Street, to the rails in Exchange place, thereby relieving Westminster Street from the congestion of travel incident to so many cars on that thoroughfare by turning some of them through Canal Street and Exchange Place. The tracks in a portion of Westminster and Weybosset Streets have been renewed with new rails weighing 104 lbs. to the yard, laid on a concrete bed, the most modern and substantial form of construction employed in street railway work, and the tracks in Elmwood Avenue from Trinity Square to Earl Street have been replaced with an 8-in. T-rail, weighing 80 lbs. to the yard. In all of the recent track work done by this company "continuous" rail-joints have been used.

The capacity of the main power station on Manchester Street in the city of Providence has been increased by the addition of a Westinghouse vertical engine and generator of a maximum capacity of 6000 hp, and four Babcock & Wilcox boilers fitted with superheaters. The addition of this large unit completes the equipment of the present power station, which now contains apparatus capable of developing a maximum of 24,000 hp, making it, with one exception, the largest electric power plant in New England. This station has now been in operation for about a year. The station on Eddy Street is kept as a reserve to meet any possible emergency that may arise from the disablement of any part of the main station.

Outside the limits of the city of Providence all the lines controlled by the Rhode Island Company are now operated from rotary sub-stations receiving current from the main power station. These sub-stations are located at Pawtucket, Attleborough, Barrington, Riverview and Westcott. The largest of these is at Pawtucket, and contains rotary converters having a rated capacity of 2000 kw. All of the sub-stations are of fireproof construction throughout, being built of brick, with steel floor beams and roof trusses. The floors are concrete and the roofs of tile. To facilitate the handling of the apparatus in all of these stations, they have been equipped, like the Manchester Street power house, with overhead traveling cranes.

The storage capacity of cars has been increased by building an addition to the North Main Street car house, Providence, measuring 134 ft. x 200 ft. This car house is divided in the center by a longitudinal wall, one section being provided with pits below the tracks to facilitate the examination and repair of car equiments. This car house is of brick, with steel roof trusses, one story high, except on the North Main Street front, where it is two stories high, to provide an office for the foreman and a locker room and lavatories for conductors and motormen. The building is protected from fire by a sprinkler system connected with the Providence high-service water mains.

The transportation facilities have been largely increased by the addition to the rolling stock of sixteen 25-ft. vestibule cars, twenty-seven 13-bench open cars, one double-truck locomotive, three double-truck sprinkler cars, three 10-ton flat cars, one track service car and three side dump coal cars. A change in the operation of the cars on the lines between Pawtucket, Attleborough and North Attleborough has been made recently, by which passengers are enabled to make a continuous trip between Providence and those towns. This arrangement of through lines to Attleborough and North Attleborough, via Pawtucket, from Providence, was brought about by the relocation of tracks in the city of Pawtucket, where the standard gage system was substituted for the narrow gage, and also by the connection of the tracks in North Main Street in the city of Providence with those in Exchange Place and Canal Street.

THE "TROLLEY WAYFINDER"

The "Trolley Wayfinder," the official guide to trolley routes in New England, published by the New England Street Railway Club, has been issued for 1905. This year the "Wayfinder" is supplemented, in a separate publication, by a bird's-eye view in colors of the electric lines of which complete data of fares and distances are given in the "Wayfinder." An ingenious table in the "Wayfinder," in the form of a circle, gives the night schedule of all lines into Boston that terminate at Adams Square. In all other respects the "Wayfinder" is the same welcome little visitor it has been since the first year of publication. It is not an historical hand-book and does not pretend to be one. For these one must turn elsewhere. As an official guide, giving time, distances and fare for all New England, it is, however, a publication par excellence. As a general index there is printed in the fore part of the book a list of several hundred cities and towns, arranged alphabetically, reached by electric railway. Under each city or town direct information is given as to time, fare and distance, or reference is made to the tables giving this information in detail. There are no less than twenty-eight of these tables. The "Wayfinder" and the "Bird's-Eye View of Trolley Lines" are edited by John J. Lane, editor of official publications of the New England Street Railway Club, 12 Pearl Street,Boston, and may be obtained from him by mail at 10 cents for each publication.

The Cincinnati, Lawrenceburg & Aurora Railway is operating limited train service between Anderson's Ferry (Cincinnati) and Aurora, Ind. There are four trains each way a day, making the 24 miles in fifty minutes. The schedule for local cars is one hour and thirty minutes.

THE JUNE MEETING OF THE INDIANA ELECTRIC RAILWAY ASSOCIATION

The June meeting of the Indiana Electric Railway Association was held June 8 in room 608 Terminal Station Building, Indianapolis, Vice-President J. W. Chipman presiding. Forty members and five visitors were present. After disposing of routine business, Mr. Chipman announced that the chief topic for discussion was "Train Despatching," and introduced O. P. Spillman, chief train despatcher for the Indianapolis & Northwestern Traction Company. Mr. Spillman said he had not prepared any formal paper on the subject, but described the method of despatching on his line, aided by blanks and forms. Mr. Spillman said that after communicating with a number of interurban roads with a view of ascertaining what, if any, system was in use, and the most practicable, he found that as yet train despatching is a kind of go-as-you-please affair. No two roads follow the same system, and some none at all. He thought it would be conceded by all that the safety of persons and property, as well as a return to investors in interurban enterprises, makes this branch of the service one of vast importance, for it is upon the reputation for safety, carefulness and regularity with which trains are run that a road must stand and be judged by the public.

In the despatching of trains upon electric railways there are three fundamental principles to be taken into consideration: Safety, despatch and economy. First, and above all others, is safety, not only to persons, but to property. No other consideration should be brought to bear with the limit of safety in question: safety, first, last and all the time. Next comes despatch, the prompt handling of trains, giving them all possible despatch commensurate with safety. This the patrons of the road have a right to expect and demand. Next, economy. While the speaker placed this last, it is of great importance. Economy in the number of trains run, but not to the detriment of the service or to despatch and safety.

Mr. Spillman said interurban roads being yet practically in their infancy, have not the advantage of the service of old experienced men. On steam roads a man must serve an apprenticeship, while on electric lines a man without any previous knowledge may in a short time qualify for service upon either the front or rear end of a train. Mr. Spillman insisted that great care should be exercised in the selection of men, and, as thoroughly qualified train men are a great help to a depatcher, he thought it should devolve upon the chief despatcher to conduct examinations of all applicants so far as such examination pertains to the books of rules, time card and the running of trains. He said discussions of time-card rules and rights were indulged in by men who have grown gray in the service, and they will be found taking opposite sides. When such questions come up with his company, or when, on account of trouble on the line, wires down and trains late, a train crew is undecided just what its rights are or what to do under certain circumstances, it is well to make a memorandum of each question or case and bring it before men in the service, embodying it in the examination of all new men, that all may have the same understanding.

The special attention of train men should be called to the time card, since it is a general law governing the movement of all regular trains. In interurban parlance, every train shown on the time card is a regular train. An extra train is not shown, nor has it any time card rights, and is inferior to any train of whatsoever class that appears on the time card. The three expressions, time card, regular and extra, are interwoven and are important factors in the safe handling of trains. The speaker said that a point that despatchers lay particular stress on is, that a train is not due to meet any particular car or crew, but a train of a certain number. When the line gets in trouble so that there is no communication with the despatchers, and a train is met at a siding, stop and ask what number it is. Do not take it for granted that because it is the regular crew that has been met for weeks, that it is the train you are due to meet there. Unless a late train has enough layover time at the terminal to enable it to get out on time, you will have it late on its return trip and it may be necessary to fill in the run from some point where you have an available car and crew, and you must either run the late train through or unload the passengers, to be picked up by a following train. In either case additional expense is incurred. If in the first place the train is not too late and you can give it a little advantage over opposing trains, and divide the delay between three or four trains, each of which may be able to make up a little time, you will soon have them all on time. But if you run the train late or annul it, you will hear a loud complaint from your country patrons, especially if the weather be inclement.

The speaker said until some better means of communication for the transmission of train orders than the present telephone system is found, he strongly favors making all trains on the time card of the same class. If you have superior and inferior trains, when an inferior train gets late and there is trouble on the telephone line, nothing but superior trains will move and it will take but a short time to demoralize the schedule. If all trains are of one class they can all go to their scheduled meeting point, and you can thus take care of your local business. This plan works equally well or better when there is no telephone trouble, for if it is desired to give an important train the advantage over one of minor importance, it can be done by special order with little trouble.

Mr. Spillman said he knew of no better way to express his views on the subject than to acquaint the members with the system in use upon the Northwestern, hopeful that by discussion and criticism all may be benefited. With a train sheet, showing eighty-two regular and a large number of extra trains daily, the company uses the standard system of despatching slightly modified, so as to be applicable to interurban service, and finds that it fills all requirements. The main principles of this system are: "That all orders must be in as few words and as plain meaning as possible;" "In giving one train a right over another, the train from which the right is taken must first be given the order;" "The words 'meet' and 'pass' to be construed in their literal sense." An order to meet a train means just what it says, and an order to pass a train means to pass a train going in the same direction. The speaker defined a train as a motor car, properly equipped with or without additional cars. The speaker exhibited bulletins showing the kind and wording of train orders in vogue on his road, and said all trains affected must be furnished an exact copy of the order.

In connection with this system of despatching, Mr. Spillman said the company used the block signal system not to run trains by or to give them any authority to proceed, even if block shows clear, unless they have a time card right to do so. This gives an additional safety precaution against a despatcher giving a lap order, or a train crew reading its order wrong or running by a meeting point. A train finding a red block against it at other than a meeting point is required to stop and call up the despatcher. Should the telephone line be in trouble and impossible to get the despatcher, the train waits seven minutes, and then if no opposing train is in view, proceeds upon its time card rights. Here the speaker earnestly advocated the close adherence to every precaution for safety, and said a conductor had no right to exercise what is sometimes called "best judgment." It is not the ninety and nine cases where a train can run by a red block in safety, but the one lone instance where the collision might occur that we wish to guard against. Mr. Spillman said that too much care cannot be taken to impress train men with the importance of the rule that "a fixed signal imperfectly displayed or the absence of a signal where one is usually shown must be regarded as a danger signal."

Train orders are received by the conductor and are in effect until fulfilled, superseded or annulled. Both the motorman and conductor read the order to make sure they both understand it alike. An exact copy of each order is kept by the despatcher. If all trains are of the same class, scheduled meeting points are definite; a train, however late, has a perfect right to go to such meeting point against any opposing train, unless the meeting point is changed by a special order. The company provides for this by requiring a train to report to the despatcher when it becomes five minutes late and it is found that schedule time cannot be made. A train arriving at a meeting and not finding the expected train there, or in sight, must report to the despatcher at once. The speaker said that in the majority of cases of collisions an extra train will be found to be one of the factors. Too much care cannot be exercised in their movement; and the crew must ever bear in mind that it has no rights except such as are conferred by the despatcher, and must keep entirely out of the way of regular trains. Mr. Spillman showed by charts how extra trains could be run by orders from the despatcher, which practically made them regular trains with definite meeting points. He also showed how an extra train of great importance may be given the right of way over all other trains. He also explained the rule governing work trains, and exhibited forms in use on his line.

Where trains are run in sections, if deemed advisable to run more than one train on schedule, the simplest manner in which it can be done is the best. This is by giving the regular train an order to carry signals. Mr. Spillman said the form in use on his line was enough for all ordinary cases and sufficed last week to bring into Indianapolis nine sections of one train all loaded to the guards. They left a station 45 miles from Indianapolis thirty-five minutes late. The first one arrived on time, and the ninth one was nine minutes late.

DESPATCHING ON THE INDIANAPOLIS & EASTERN

Walter L. Pearson, chief train despatcher for the Indianapolis & Eastern Traction line, was next on the programme, and presented a paper involving the method of despatching on that line, in which he said:

The despatcher's office is furnished with a train sheet and train-order book, which is adapted to all requirements. All train crews are furnished with train-order blanks, also a timetable showing all the regular trains operated. The passing points are marked with heavy black face type, also the train number of all trains passed at each passing point. All train crews report at the terminals for orders and compare their time with the Western Union clock at the despatcher's office. Train crews reporting on schedule time are given their time card rights and meet trains as per time-table. Train crews reporting late are given orders, which are written down by the conductor on a form provided for the same, and the order is then repeated to the despatcher, but is not in force until his "correct" has been received. Conductors then read and deliver the order to the motormen, who turn in the same at the despatcher's office at the conclusion of a run. The despatcher then compares the orders with his copy in the order book, and, if correct, the orders are destroyed; otherwise they are held for investigation. Copies of orders in the order book are retained and all order books are filed at the superintendent's office.

Train crews are allowed but one minute grace at passing points, and must meet trains within one minute of schedule passing time, or report before the train from the opposite direction is due at the regular passing point. Under this condition the despatcher never has to say, "Can you see them coming?" or "Call again in a minute or two," but knows exactly what order to give when he hears from a train crew; and, in the writer's opinion, this is the best and safest way to operate. Late train crews running on train orders must maintain running time or report in time to advance trains from opposite direction.

All cars are provided with a portable telephone, and a "drop" is provided for the same every half mile. Each train is listed on the train sheet and has a column by itself. In case trains are late, a record is kept on the train sheet as well as the order book, as, for instance, a train has an order to pass a certain train at a certain switch. It is marked in said train's column opposite said switch, Pass No. 101, or whatever train it may be. If a crew has an order to report at a certain point, it is marked on the train sheet in the same manner as just mentioned. The object of this is that the despatcher may always have a record of his orders before his eyes, and also that he can leave the desk at any time and another man take his place without causing any complications whatever.

In case a regular train becomes late and is being followed by a limited train, and the limited train passes around the regular train at other than a regular passing point, the regular train notifies the despatcher at once, so that he may know that the limited train is ahead and is making schedule time.

All train men are under the immediate instruction of the chief despatcher in the absence of the superintendent. All second-class trains, including freight, construction, work and line cars, are run as extras and display signals accordingly. These trains have no rights except those given by despatcher, and must be in the "clear" four minutes before the arriving time of all first-class trains. In case the telephone line is out of service, eastbound trains have the right of way over westbound trains five minutes after schedule passing time.

All conductors are supplied with a tin box containing all necessary signals. Conductor must have this box on his train at all times when on duty. Green flags by day and green lights by night are known as caution signals, and all trains must be under full control while passing over a section of track where such signals are displayed. Green signals are also used on front of trains running in two or more sections, and denote that the second section of such a train is entitled to the same rights as the first.

A motorman running the first section of a train which is in two or more sections, passing a train in a siding, must salute the train in the siding with one long and two short blasts of whistle, which signify that there is another section to his train, and he must not pass the train in the siding until he has been answered by two short blasts of whistle, which signify that the train in the siding is aware that the train on the main line is running in two sections.

Red flags by day and red lights by night are known as danger signals, and when displayed on the track they must not be passed until the cause of danger has been ascertained and the signal removed.

A book of instructions, covering all the points above mentioned, is furnished to each of the employees of the Indianapolis & Eastern Traction Company.

DISCUSSION

At the conclusion of the reading of Mr. Pearson's paper, President Chipman said: "Gentlemen, we have heard Messrs. Spillman and Pearson with interest and profit, and while they cannot well get away from what they say, it is an opportune time to fire a lot of questions at them."

Mr. White asked Mr. Spillman what rule prevailed when all communication was cut off. He replied that in such case trains were run by time card only, which gives a train a perfect right. He insisted that safety required this rule, and that while it often kept a train back it was conducive to safety. S. H. Knight asked Mr. Pearson about the limitation of trains at passing points, and was advised that the rule gives each train five minutes, and if more than five minutes late they have to lay over. He also explained the method of giving late trains a few minutes of grace. The kind of sidings and the method of using them were brought up, and Mr. Spillman said that subsidings, for the most part, were sufficient, and said "head-in" use was regarded the safest. He said there is not much delay in backing out, and this form of siding afforded additional safety. In reply to an inquiry by Mr. Moore, of the Indianapolis & Cincinnati line, Mr. Spillman said all work trains were kept out of the way by giving them working orders between certain points. Work trains are extra trains and have no right, and must take sidings and be governed by flag signals and despatcher's orders.

Secretary White read a letter addressed to the association by the Indiana State Board of Health, setting out rules which the board proposes to adopt for governing the sanitation of trolley cars, and asking the association to send a delegate committee to a meeting of the State Board of Health on June 12, at which meeting the proposed sanitary rules would be discussed and adopted. (These rules are published on this and the following page.) The president appointed H. A. Nicholl, of the Indiana Union Traction Company; A. A. Anderson, of the Indianapolis & Cincinnati Traction Company, and W. G. Irwin, of the Indianapolis & Columbus Traction Company, as such committee. Mr. Chipman urged traction men generally to attend the meeting, as the question was an important one, since there is a probability of some very irksome or unnecessary conditions being imposed.

President Chipman said the next meeting of the association would be held Oct. 12. He congratulated the members of the association for the successful meetings held and said the questions discussed by capable, experienced men and the exchange of ideas and experience had proven very beneficial. He said the Indiana Association was in excellent condition and had grown in numbers until it has become necessary to secure a larger hall for the meetings.

In the afternoon the members of the association and a few invited friends were the guests of the Indianapolis & Martinsville Rapid Traction Company. The "Scenic Route Special" carried the party to Mooresville, where the power plant and shops were visited, and then to Martinsville. The return trip of 30 miles was covered in forty-eight minutes. This line parallels the Indianapolis & Vincennes steam line and skirts the bluffs that overlook White River, affording viewpoints of magnificent and beautiful scenery. For this reason it has been named the "Scenic Route." Martinsville is the "Manitou" of Indiana, its beautiful surroundings and chalybeate springs attracting thousands annually. The line will be extended to Bloomington during the present year. The party, which was under the escort of Superintendent Paul H. White and Treasurer E. R. Adams, had a very pleasant trip.

CAR SANITATION IN INDIANA

As noted in the proceedings of the June meeting of the Indiana Electric Railway Association, published in this issue, a committee has been appointed by the association to confer with the Indiana State Board of Health relative to the proposed rules governing the sanitation of rolling stock. The tentative regulations embrace the following relative to electric railways:

RULE 1

Day coaches shall be thoroughly cleaned at the end of each trip, and in no instance shall a day coach go uncleaned longer than two days. The thorough cleaning of day coaches shall consist as follows: (a) windows and doors shall first be opened, and the aisle strip, if there be any, removed from the car; (b) all upholstering dusted and brushed; (c) floor swept after it has been sprinkled with dampened sawdust, preferably dampened with 1 or 2 per cent solution of formaldehyde; (d) after sweeping as in (c) the floor shall be scrubbed with soap and water to which soda ash or like cleansing agent may be added, and after scrubbing the floor shall be mopped with a solution of formaldehyde of 1 or 2 per cent strength or with a solution of other approved germicide; (e) the arms of seats, sides of cars, window ledges and windows shall be washed with soap and water to which soda ash or like cleansing agent may be added, and after such washing, wiped off with an efficient disinfectant, preferably a 1 or 2 per cent solution of farmaldehyde; (f) closet floors and walls shall be cleaned by sweeping, washing and wiping with disinfectant solution as described in (d) and (e), and urinal and hoppers thoroughly cleaned and disinfected; (g) water coolers shall be emptied and rinsed, frequently scalded or steamed, and shall be filled with potable drinking water when in service; (h) and lastly, day coaches shall be disinfected with formaldehyde gas in quantities of not less than 40 fluid ounces of 40 per cent formaldehyde to each coach at least once each month, and also whenever a case of any listed disease is known to have been carried. Plush seats and backs shall be removed when possible, and dusted by air blast.

RULE 2

Spittoons shall be provided in smoking cars, one for each seat, and placards shall be displayed at each end of all day coaches and in all waiting rooms having plainly displayed thereon the following notice:

SPITTING ON THE FLOOR IS FORBIDDEN

Consumption, lagrippe, coughs, colds and all diseases of the air passages are spread by spitting, and these maladies kill 12,000 people annually in Indiana. It is therefore forbidden to spit on the floor. Penalty, $5 fine.

It is the duty of trainmen to warn against violating this health rule.

By order of the Indiana State Board of Health.

RULE 3

Parlor, buffet and dining cars shall be cleaned at the end of each trip, as set forth in Rule 1, carpets and draperies to be removed, dusted and sunned and aired, provided meteorological conditions permit. Food boxes, refrigerators, closets, drawers and cupboards to be cleaned, scalded and treated with a 1 or 2 per cent solution of formaldehyde at least once each week in spring, summer and autumn months, and once every two weeks in winter months.

RULE 4

Suburban trolley and street trolley cars shall be cleaned every day when in use as detailed in Rule 1. The smoking compartments of all suburban trolley cars shall be provided with spittoons placed in the aisle, and carpets and mattings are condemned and forbidden in such compartments; but rubber aisle strips may be used. The notice given under Rule 2 shall be posted in all street trolley cars, except in cities having an ordinance against spitting.

RULE 5

Conductors and motormen shall pay proper attention to ventilation, and shall promptly reprove and warn all persons who spit on the floor or otherwise befoul the car in which they are riding. They shall also inquire concerning any case of sickness which they may notice, and determine as best they can whether or not it is a listed disease. If found to be listed, the health officer at the next stop may be appealed to for the purpose of caring for the case as seems best.

LISTED DISEASES

The listed diseases shall be: Smallpox, diphtheria, scarlet fever, erysipelas, measles. Common carriers and their employees are forbidden to knowingly carry any person afflicted with the above-named diseases.

REPORT ON STREET RAILWAY EMPLOYEES

An extended report on street railway employees in the United States, by Walter E. Weyl, Ph. D., has recently been published in Bulletin No. 57, of the Bureau of Labor, of the Department of Commerce and Labor of the United States. Dr. Weyl first gives some statistics as to the number of employees engaged in street railway work, stating that in 1902, excluding officials and clerks, the number of persons engaged in street railway transportation in this country amounted to 133,641, or almost one-eighth of the number of men employed in steam railroad service. The character of the work in which these men are engaged has led to the selection, among the numerous applicants for positions, of men with good physieal and mental ability capable of coping with the difficulties. While efforts are made to retain employees with experience as long as their physical vigor remains unimpaired, the majority of companies exclude from their employ new men over 40 years of age. In a considerable number of cases the limit is placed at 35. The minimum age for taking conductors is usually 21 years.

Street railway companies also usually establish a certain definite minimum weight for conductors and motormen. While the rule may not be in every case rigidly enforced, in many companies the applicant is actually weighed. Even though companies do not prescribe in their rules the minimum weight accepted, they are inclined to reject men who are undersized.

The average weight required of conductors is about 145 lbs. One company insists on a weight not less than 120 lbs., one upon 125 lbs., two upon 130 lbs., four upon 135 lbs., three upon 140 lbs., two upon 145 lbs., eight upon 150 lbs., four upon 160 lbs. and two upon 165 lbs. The minimum weight required of motormen is somewhat higher, ranging about 150 lbs. One company insists upon a minimum of 120 lbs., one upon 130 lbs., two upon 135 lbs., two upon 140 lbs., three upon 145 lbs., ten upon 150 lbs., seven upon 160 lbs. and four upon 165 lbs. The average minimum weight for conductors upon twenty-seven street railway companies was 145.4 lbs., and for motormen upon thirty railways, 150.5 lbs.

The companies also establish definite standards of height for all applicants for the positions of motormen and conductors. Undersized men and men of light weight or small strength cannot generally secure a position. As a rule, no man under 5 ft. 6 ins. or 5 ft. 7 ins. can secure employment as a street railway conductor, and no man under 5 ft. 7 ins. or 5 ft. 8 ins. as a motorman.

An investigation of thirty-eight companies showed that in five companies the minimum height required of conductors was 5 ft. 4 ins.; in one company, 5 ft. 5 ins.; thirteen companies, 5 ft. 6 ins.; five companies, 5 ft. 7 ins.; two companies, 5 ft. 7½ ins.; ten companies, 5 ft. 8 ins.; one company, 5 ft. 9 ins., and one company, 5 ft. 10 ins. The average minimum height required by these thirty-eight companies was 5 ft. 6.6 ins.

The minimum height required of motormen is somewhat greater. In three companies the minimum height required was 5 ft. 4 ins.; one company, 5 ft. 5 ins.; ten companies, 5 ft. 6 ins.; five companies, 5 ft. 7 ins.; one company, 5 ft. 7½ ins.; seventeen companies, 5 ft. 8 ins.; one company, 5 ft. 9 ins., and one company, 5 ft. 10 ins.

The average minimum height for motormen required by these thirty-nine companies was 5 ft. 7 ins.

An attempt was made to discover to what extent the ranks of street railway men, and, above all, of carmen, were recruited from the country and city, respectively, and which of these two classes of labor was preferred by the companies. It was found that in a majority of places the ranks of the street railway men were recruited from both sources. A number of companies stated that they had no preference; a few stated their preference for city men; the overwhelming majority were in favor of men from the country. The reasons given by the minority of the companies for preferring city men was on account of their knowledge of the streets and their greater intelligence, while the majority preferred country men because of their working at lower wages and for longer hours, and on account of their greater honesty. No accurate statistics can be given as to the exact proportion of these two classes.

The report also presents tables showing the hourly rate of wages for 345 companies. This table is taken from the testimony in the recent arbitration case of the United Railroads of San Francisco.

Other subjects discussed are the nativity, citizenship, age and conjugal and general condition of employees, former conditions, health of street railway men, discipline of street railway employees, standardization of rules, the merit system, pensions, Sunday employment, regularity of employment, organization of street railway employees, mutual benefit associations, accidents, legal status of street railway employees.

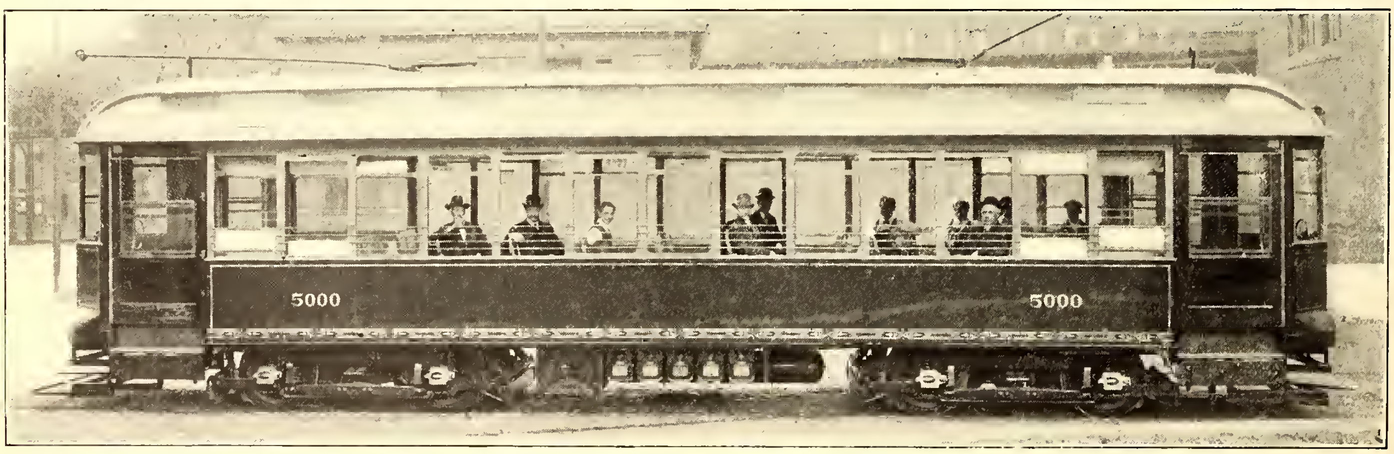
THE NEW STEEL CAR FOR THE EAST BOSTON TUNNEL SERVICE

The Boston Elevated Railway Company has recently constructed, at its Bartlett Street shops, a street car of somewhat novel design and construction intended for use in the East Boston Tunnel service and the streets connecting therewith.

The car, of which a plan view was presented on page 868 of the STREET RAILWAY JOURNAL for May 13, is of a semi-con-

AN INTERIOR VIEW OF THE NEW STEEL CAR FOR THE EAST BOSTON SUBWAY

vertible type, so that it may be used advantageously in either summer or winter service, and is intended to provide a maximum carrying capacity, with quick and easy ingress and egress of passengers, and having its entrances closed while in motion, with a view to the prevention of accidents. Strictly speaking, the car has no platforms, the floor of the car being continuous and at the same level to its extreme ends, and the car is closed



THE BOSTON ELEVATED RAILWAY COMPANY'S STEEL CAR COMPLETELY EQUIPPED FOR SERVICE IN THE EAST BOSTON SUBWAY

by sliding doors in the side, with no full bulkhead separation between the platform portion and the body of the car.

Attention has been paid to securing the greatest possible width of aisle and, in construction, to attain the lightest possible weight consistent with necessary strength. The general dimensions of the car are as follows: Length of the body, 33 ft. 3 ins.; length over all, 45 ft. 10¼ ins.; width over all, 8 ft. 6 ins.; height from the bottom of the sill to the top of the roof, 9 ft. 8 ins. The height from the rail to the top of the roof is 12 ft. 3½ ins.

As the car was to be used in the tunnel, it was decided to make it fireproof, or as nearly so as practically necessary. To this end the bottom framing is composed largely of steel angles and I-beams. The side sills are made of three angles, hot riveted together in such form as to allow the window sashes to drop into the pocket to the bottom of and outside of the sill. The cross sills consist of I-beams riveted to side sills with steel knees and having oak fillers on either side. The end sills are made up of two steel plates, 6 ins. x 1 in. and 6 ins. x ¾ in., formed to practically the same lines as the bolster, in an inverted position.

The extension of the car beyond the main end sills, there being no drop platforms, is supported by two pairs of 3-in. I-beams, with oak fillers, running under the top and resting on a casting on the bottom member of the end sills, and extending back to the bolster and secured to the same; the outside supports are steel angles, 6 ins. x 3½ ins., riveted to side sills and securely bolted to the end sills. The ends are further supported by a ⅞-in. rod passing over the end sill, running back to the bolster, and may be taken up at the anchor casting on the outer end.

The floor is of hardwood, painted with fireproof paint, the under side lined with asbestos and further protected with heavy sheet tin thoroughly painted on both sides. The body framing consists of twelve T-iron posts on each side, running straight up from the sill to the roof plate and interlocked at the window stool. The letter board is a 7-in. x ¼-in. steel plate running the entire length of the car and riveted to the posts.

There is a soft steel truss, 3½ ins. x ⅜ in., supported at the posts directly over the bolsters by a block gained into the posts, the lower ends passing through the side sill and provided with anchor castings and take-up nuts. The sides of the car, from the sill to the windows, are built in with longitudinal sheathing ¾ in. thick and covered with ⅛-in. steel plates riveted to the window stool and bolted to the side posts. The roof is of the steam-car type, the top covered with 8-oz. duck, painted and sanded.

The conspicuous features of the design are the side end doors and folding step operated by compressed air. The doors are 3 ft. 6 ins. wide and will admit two persons side by side directly into the car, there being practically no platforms. The motorman's cab is so arranged with folding doors as to make a separate compartment while in use, or may be folded out of the way, leaving the space open. A pocket, lined with sheet iron and asbestos, is provided in the cab over the motorman's head, and contains all switches, fuses, etc., mounted on slate panels. The maximum inside width of car is obtained, the wall being only 2½ ins. thick, thus with 8 ft. 6 ins. over all, there is an inside width of 8 ft. 1 in., which admits of cross seats 34½ ins. long and a 28-in. aisle.

The sashes are of channel bronze and are divided into two parts, the top sash being 9 ins. x 28 ins., and may be raised its full height; the lower sash is 33 ins. x 28 ins., and may be lowered flush with the top of window stool, which is but 27½ ins. from the floor. This is accomplished by the novel side-sill construction, which, with the car siding, forms a pocket into which the sash may drop. The window runs are provided with an automatic cover which comes into place and prevents the dropping of articles into the sash pocket when sashes are raised.

There are fourteen reversible transverse, four fixed transverse and four longitudinal seats, giving a seating capacity of fifty-two persons, with ample knee room, and a floor space of 12 ft. from the end of the car to the cross seat. The interior of the car is lined with sheet aluminum, the head lining being finished its natural color and the standing finish painted a rich olive shade, decorated in gold. The car is beautifully illuminated with six 5-light circuits and provided with illuminated signs.

The electrical equipment consists of four GE 74 motors, having a rated capacity of 65 hp, and Sprague-General Electric control similar to that installed on the later elevated car equipment of the company. The fifteen contactors, with interlocks

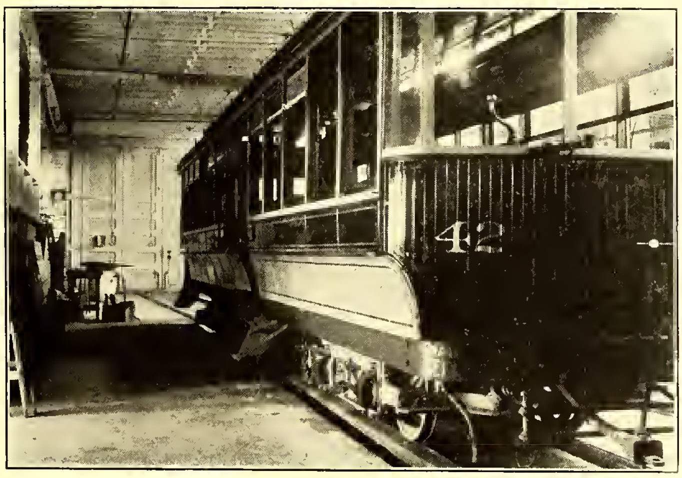


FIG. 1.—A PART OF DENVER PAINT SHOP, SHOWING TROUGH HOLLOWED OUT IN CONCRETE FLOOR BELOW THE CAR SILL

and auxiliary rheostat, are arranged in one iron box beneath the car, the cover of which is arranged very conveniently for inspection and adjustment of contactors and interlocks. The reverser, which is also beneath the car, is well protected by an iron box, which also contains switches for cutting out the several motors; all wiring is run in iron pipe conduit and great care taken to eliminate all possibility of fire. An important feature of the control equipment is the automatic relay throttle which governs the acceleration of the car; another is the train line cut-out switch, by means of which the motorman can open the train line circuits on each car. It is intended to use this car as a motor car of a train of two cars of like size, the train to be driven either end forward, the second car being without motors.

The tunnel contains long grades of 5 per cent and less, and at present affords no opportunity for looping cars at the terminal. The motors are mounted on Brill 27-E-1 trucks having 33-in. steel-tired wheels and 4½-in. axles.

POINTERS FROM THE DENVER PAINT SHOP

The Denver City Tramway Company recently changed over one of its old cable houses into a modern paint shop. Concrete floors were put in and on some of the track a scheme has been used which would be useful in any car house or paint shop where car washing is done. This consists of a trough hollowed out in the concrete floor just below the car sill, as shown in Fig. 1. This trough is drained to the sewer and catches all the drippings from the side of the car when the car is being washed. This prevents the general flooding of the floor which is common in car washing rooms, and keeps the water in a location where it is least inconvenient.

In this shop, racks for holding window sashes while drying are used which are very similar to others which have recently been illustrated in these columns. One of these racks is seen at the left in Fig. 2. On the table at the left in this figure there is also seen a revolving stand on which windows are placed while the sash is being varnished. Fig. 2 also shows

FIG. 2.—INTERIOR OF PART OF PAINT SHOP, SHOWING WINDOW-SASH RACKS ON LEFT AND RATTAN SEATS RACKS ON RIGHT

the rattan seat racks at the right, and in the middle of the picture in the background is the storeroom for the paint. This is separated by a fire wall from the rest of the shop. In fact, it is in the nature of a vault, save that it has windows opening to the outside. Barrels of sand for fire extinguishing purposes are kept around the shop, as can be seen in Fig. 2.

PENNSYLVANIA ELECTRIC LOCOMOTIVE

According to Philadelphia papers, the Pennsylvania Railroad has commenced the construction, at its Juniata shops at Altoona, of the first of its electric locomotives to be used at the New York terminal. The locomotive is to be built in two sections, each having four 65-in. drivers, and the length over all is 37 ft. 10½ ins. When the frame is completed it will be sent to the Westinghouse works at Pittsburg for electrical equipment.

A system of electric tramways was recently inaugurated at Malta, with 10 miles of track in use, and soon nearly double that mileage will be worked. The rails came from Pittsburg, Pa., and the motors in use were made at the Westinghouse works in England. The cars, which are of the "double-decker" pattern, were manufactured at Manchester, England. The power station is complete in every detail. There are two sets of engines of 365-hp each from the establishment of Allen & Son, of Bedford, England. M. D. Jeffs, of New York, is general traffic manager. The road was constructed and is operated by Macartney, McElroy & Company.

THE QUESTION BOX

The answers this week include practical information relating to oil lubrication, forms of oil cups, power station topics, track construction and a car for testing rail-bonds.

A.—GENERAL

A 13a.—How can the claim department best co-operate with the operating department in the prevention of accidents?

We were very successful with our claim department last year. We paid out .84 per cent of our gross receipts, which includes the cost of damages and accidents and the cost of conducting the claim department. This is the lowest in the history of the company.

We give merits to all employees who give us a full and complete report on accidents and who secure witnesses for accidents other than those in which they were interested, and if there is anything especially interesting the claim department or the superintendent prepares a bulletin on the accident, pointing out how it might have been possible to have prevented the accident. As soon as the claim agent has looked over the accident reports they go to the superintendent and he looks them over and talks them over with the division superintendents and the inspectors. The monthly report of the claim agent shows the number of accidents classified according to their causes, and each month we take up one certain class of accidents and give that class especial attention. For instance, one month we make a special effort to clean up accidents "alighting from cars." We found that about two years ago 70 per cent of all our accidents were to people while alighting. This year, so far, by constantly talking with the men and the division superintendents we have reduced this to 35 per cent. We find the best results in cleaning up one kind of accident at a time, and when we get that in pretty good shape take up another kind. We have reduced our accident expenses in the past five years from 3 per cent to less than 1 per cent of the gross receipts.

JOHN A. BEELER, V. Pres. & Gen. Mgr.,
Denver City Tramway Co.

A 13b.—Have you ever used the camera to good advantage in adjusting damage claims? Please give details.

We use the camera in a great many ways and have found it of inestimable value. There have been many instances in which the camera was most convincing. We have, as a rule, employed a local photographer, although we have done some amateur work with some of our men, but as a rule for large pictures we secure a regular professional photographer. In the engineering department one of our engineers, who is an amateur photographer, keeps accurate record of all of our construction work, etc. We have found the photographs of great value in a number of ways.

JOHN A. BEELER, V. Pres. & Gen. Mgr.,
Denver City Tramway Co.

E.—MASTER MECHANIC'S DEPARTMENT

E 46a.—State experience with use of oil instead of grease for lubricating motor and axle bearings.

I have been using oil on armature bearings for the past thirteen months, and find that I can obtain twice the life or wear out of babbitt bearings and save one-quarter on the cost of lubricants.

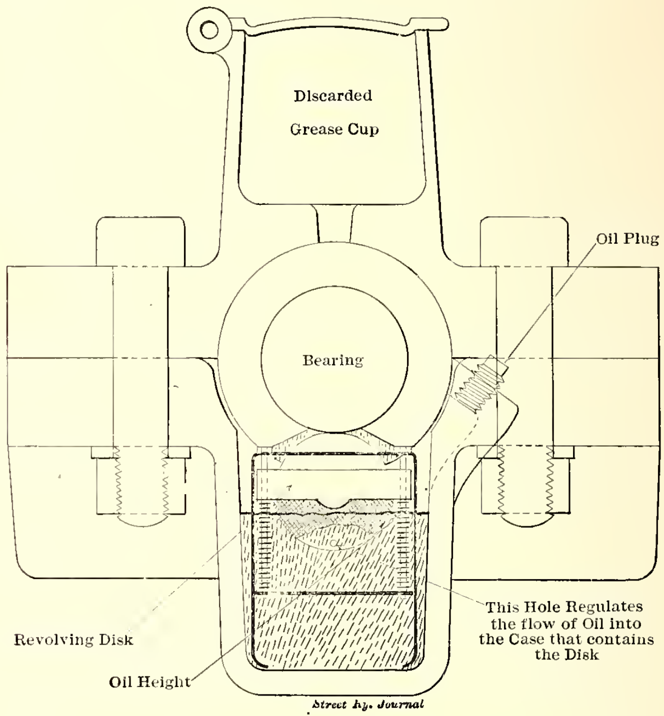
W. C. DE VANE, Master Mechanic,
Savannah Elect. Co., Savannah, Ga.

Motor bearings will run longer with oil lubrication than with grease, and the bearings will run about 15 degs. F. cooler. It has been noted that after oil has been used on the motor bearings cars that had formerly used grease would run freer and drift better. A good portion of the oil fed to motor bearings finds its way into the gear casings, giving the gears better lubrication than where cheap gear grease is employed. When using grease on motor bearings the oil well under the bearing is of no value, as the grease forms a glaze on the felt feeder, which effectually prevents the transfer of oil to the shaft. After a time with the above conditions the well becomes filled with a black, pasty mass that has to be dug out. On bearings using oil this well is replenished as the oil is fed to the bearing, the felt remains clean, and is of real assistance to the motor lubrication. When an oil cup is used on the motor it can be adjusted to a very slow-feed if the oil well under the shaft or axle is kept in good condition.

J. W. BRIDGE, Master Mechanic
West Penn Railways Co.

E 47.—Give description, with sketch of oil cup or journal box, suitable for using oil as the lubricant.

The writer is using the lubricating device shown in the accompanying illustration. The chief feature of this lubricator is a small revolving wheel, or disc, which is carried beneath the journal so that it will just touch the shaft, and as this disc turns it carries the oil upward. The disc is located in an oil-tight case, which has an oil inlet near the bottom. The bottom portion of the case is entirely enveloped by a fine strainer, and the lubricant in passing through this strainer is relieved of all solid and foreign matter, such as grit and similar substances. The disc is carried in a frame, which contains guides that pass through the extended ends of case and strainer, and around these guides are coiled springs, the lower ends of which rest on a cross-bar and the upper ends bear against the case carrying the disc, so that the tension of the springs will keep the disc in contact with the journal. The oil is placed in the cellar of the journal box. The lower edge of the



OIL CUP USED BY SAVANNAH ELECTRIC COMPANY

disc is, of course, below the surface of the oil but cased away, and the oil passes through the straining device and the small oil hole or inlet to the disc. This device can be fitted to all the standard types of motors without trouble.

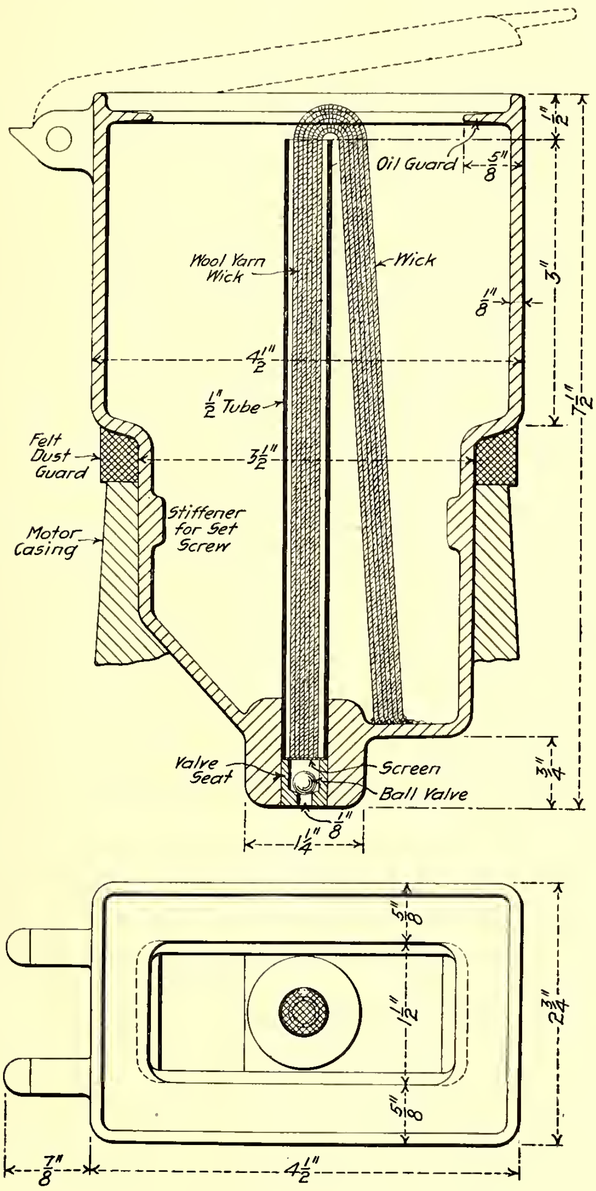
W. C. DE VANE, Master Mechanic,
Savannah Elec. Co., Savannah, Ga.

The drawing shows an oil cup designed by the writer and W. E. Moore especially for No. 56 Westinghouse motor, though its principle can be used on any railway motor. The cover of the motor lubricant receptacle is cut off and fitted to this cup. A wool-felt collar is slipped around the lower part of the cup, which is then inserted into the motor, the wool-felt forming a dust collar. The cup is held in place by one or two set screws with nuts and lock nuts. The oil cup consists of a receptacle to hold oil, a tube that extends from the bottom to near the top that holds the wick and transmits the oil to the screen, a wick that feeds the oil into the tube, a screen that screens the oil, a valve seat and ball valve that automatically feeds or shuts off the flow of the oil, an oil guard consisting of a ledge around the top of the cup that prevents the waste of oil and acts also as a dust guard, and hinges, to which the oil cup cover is hinged. The wick leads from the bottom of cup up and into the tube, down the tube to top of screen, and thence to valve.

The cup is so constructed as to reduce danger of leakage of oil to a minimum. The oil-carrying tube is forced tightly into the bottom of tube cup. The valve seat is also forced tightly in and the ball is then inserted. The screen is placed on top of the valve seat. No holes are drilled into the oil receptacle, otherwise than the one in which the valve seat and tube are pressed. The oil guard projection prevents the waste of oil from the wave motion set up when car is in motion.

The flow of the oil is regulated by the amount of wicking used. The cup holds one pint. This capacity means a reliable feed for a long time, thus obviating the danger of armatures down on the pole pieces due to lack of inspection. Clean oil is provided, due to taking the oil from the top, and also to the filtering action of the wick. The valve comes in close proximity to the shaft, and the warmth from the bearing transmitted directly up the tube prevents the oil from congealing in extremely cold weather.

Some 400 of these cups are in operation on cars of the West Penn



OIL CUP USED BY WEST PENN RAILWAYS

Railways, and all of our motors, which have been standardized to the Westinghouse No. 56, are being similarly equipped.

J. W. BRIDGE, Master Mechanic,
West Penn Railways Co.

G.—THE ENGINE ROOM

G 3.—Is it practicable to run a commercial lighting or power load from generating units that are supplying current for railway purposes? How can it be done? What is the best method of regulation in such case to prevent fluctuations in the lighting or power circuit?

The entire lighting motor and railway load of this company has been carried for the past two years on a 400-kw Parsons turbogenerator, with an average variation of voltage on our lighting circuit not exceeding 1 per cent each way. This has been accomplished through a Tirrill regulator and a storage battery in parallel with the railway load. The daily output on our railway circuit is about 2500 kw-hours; on the light and power circuit about 2500 kw-hours. Our station bus-bars carry 380-volt, two-phase, 60-cycle current, which is stepped up to 2200 volts for the light and power circuit, and to 10,000 volts for the sub-stations. The above arrangement has given uninterrupted and satisfactory service since April 22, 1903.

A. B. SKELDING, Gen. Mgr.,
Consolidated Rys. Light & Power Co., Wilmington, N. C.

G 8.—A young engineer, who has yet to win his spurs, has been given charge of the power house on a twenty-car road. He has been asked by the manager to carry out a general efficiency test of the entire station. He wants suggestions from some of the older heads as to some of the things he should and should not do in carrying out these tests. He wants to know how to dispose his available forces so as to obtain the data without taking on additional help. If your manager should ask you to make tests and report on just what each department of the power house was doing and could do, how would you go about it to get the information? This is a matter especially worthy of discussion. Suggestions are particularly requested.

A young engineer who has yet to win his spurs should not be expected, and should not attempt, to make efficiency tests of each sub-division of his power plant, because he will have to win his spurs before he is competent to do so. If he can obtain the data necessary for such tests without taking on additional help it is high time to reduce his present force. If the young man can induce his manager to furnish him facilities for weighing his coal into his boilers, for measuring or metering the feed-water supplied to them and for metering the output of each unit (and preferably also the total output of the station at the switchboard), and if, having these facilities, he takes pains to record his coal consumption, weight of water evaporated and output of each machine, and the total output of the station daily, he will have the means of following the conduct of his plant from day to day and month to month. Intelligent study of these data will be of great assistance to him, and it is essential to his manager, but special tests of each sub-division of his plant will require the services of an expert specialist and of considerable additional help while they are being carried on.

A. S. KIBBE, Engr., The American Rys. Co.

I.—TRACK DEPARTMENT

I 4a.—Have you any T-rails in paved streets? If so, what has been the experience with this track? Has it proved to be a serious obstacle to vehicle travel?

This company has had about 2 miles of standard 60-lb. T-rail mounted on wooden blocks in streets paved with vitrified brick and Belgian blocks for the past four years. While the results are not as good as would be obtained with a standard 9-in. girder rail they have been satisfactory to the city authorities up to the present time.

A. B. SKELDING, Gen. Mgr.,
Consolidated Rys., Light & Power Co., Wilmington, N. C.

I 20.—What are the relative costs of various kinds of woods available for ties? What are their relative length of life?

Our experience has been confined entirely to the use of yellow pine and white oak ties, and we have had the best results from the latter. Where ties have been imbedded in concrete we have found, after twelve years, where it became necessary to lay new rails, that the ties were apparently in as good condition as when laid originally. In granite block paving it has been noticed particularly that the paving pitch has really acted as a preservative. There have been instances in macadam roadways where ties have been in the ground for eleven years and have then been used in reconstruction. In estimating the cost of construction in paved streets, with concrete foundation, we never include new ties, except possibly under old special work, and these occasions are very rare.

E. H. BERRY, Engr. Roadways, Cincinnati Tract. Co.

I 21.—Has any satisfactory substitute been found for wooden ties? What has been the experience with iron, steel, glass, concrete or other materials for ties?

About five years ago there was an experimental section of track laid in this city, about 400 ft. in length, where concrete ties were used. On these ties were laid corrugated galvanized iron plates, which in turn were bolted to the face of the rail. This piece of track has given excellent service under all conditions; we have made no repairs to it whatever. The cost per tie is estimated at 50 cents, exclusive of installation, making comparative cost with wooden ties about the same.

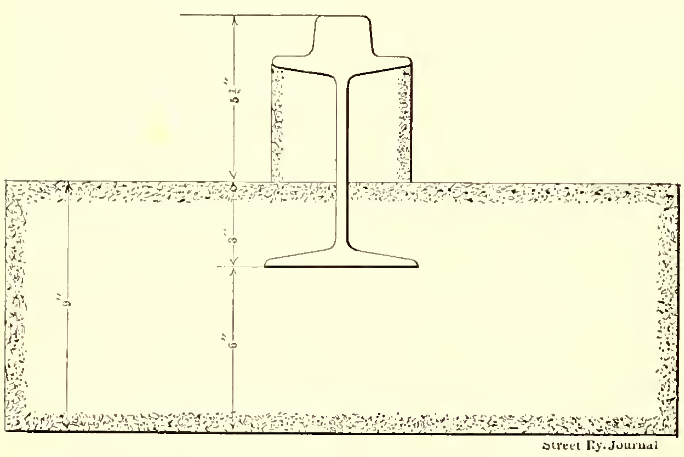
E. H. BERRY, Engr. Roadways,
Cincinnati Tract. Co.

I 22.—What has been the experience with concrete foundations under rails or roadbed? Please give details as to how concrete was laid, cost of construction and results secured. Where concrete foundations have been used under track rails, has there been any disintegration of the concrete and subsequent development of defects in the concrete covering, such as asphalt? If so, how was the trouble remedied?

If the depth of concrete under ties is not less than 6 ins., and the ties properly tamped, also allowance made for the setting of the concrete, good results should be obtained. We have found that where cars are permitted to use the tracks under ten days after concrete has been placed around ties, there is a tendency later for a wave effect. So far as general results with concrete are concerned, there is a permanancy and stability of structure that cannot be obtained by the use of stone or gravel ballast. The rails, however, have to be renewed much more frequently in the former case than in the latter. In cases of concrete beam construction we have found that if the foundation has not been all that was expected, there was a tendency toward unequal distribution of loads, causing, in one instance, the beam to fracture. This was later learned to have been owing to a broken water main in the street. For beam construction we have laid track, including ties, continuous rail-joints, tie-rods, spikes, nut locks, excavation and concrete for $1.50 per foot. We have also laid 7-in. T-rail, concrete base, bringing the concrete to the tops of the ties, for $1.01 per running foot; for concrete and labor alone, and for all material, including macadam, rails, ties, etc., for $4.05 per foot.

E. H. BERRY, Engr. Roadways, Cincinnati Tract. Co.

This company commenced laying concrete beam construction in the fall of 1896, and since that date has used it almost exclusively. The accompanying drawing shows a cross-section of the concrete beam construction which we use at the present time. Where the sub-soil is reasonably good, and the paving properly maintained, so as to prevent water from reaching the sub-grade, we have experienced no trouble from disintegration of the concrete. On the other hand, where we have installed this type of construction on clay and water has reached it we have had a good deal of trouble. The most serious objection to the concrete beam construction is the difficulty and expense in repairing it if it fails. Repairs can only be made by taking out the concrete and substituting ties if the road is in operation. We have also had some trouble due to operating the cars too soon after the concrete is installed. This should be allowed to set at least ten days, and preferably two weeks, before running any



STANDARD RAIL AND CONCRETE SUPPORTING BEAM, KANSAS CITY, MO.

cars on the line. It is impossible to give any satisfactory information regarding the cost, as this would vary so much in different localities that the cost in this city would be no criterion of what it would be elsewhere. Any engineer knowing the price of materials and the cost of labor, can make a close estimate of the construction, as shown on the drawing. I would not recommend this type of construction where the foundation is not first class.

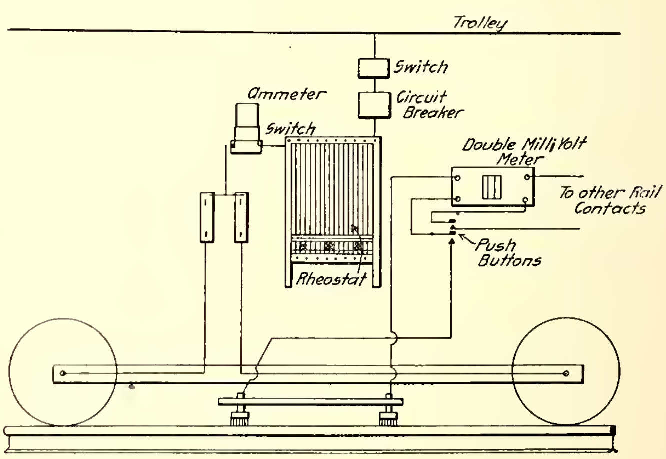
CHAS. N. BLACK, Gen. Mgr.,
Metropolitan St. Ry., Kansas City.

I 23.—What methods are available for welding joints? Please give your experience with any of the methods for welding track, including detailed cost of doing the work and results secured.

The only method of welding joints that we have had any experience with in this city has been cast welding. During the past year we have welded about 3000 joints, and up to March there had been less than three-fourths of 1.0 per cent breakage, and these were really not breaks in joints, but through the bolt holes, and in one or two cases the rails themselves have broken outside of the joint, but in every instance in the receiving rail. There has been an occasional slip joint, but that was on account of improper fusing. So far as cost is concerned, that has varied considerably, according to the traffic, condition of track and class of paving. Where the travel was very light and track conditions exceptionally bad, the cost amounted to $6.58 per joint; and in other instances, where track conditions were good and travel exceptionally heavy, and also in granite paving, the cost amounted to $8.50 per joint. In one case, in an asphalt street, where the rails were very badly battered and worn, with cars operating under about a twenty-minute headway for four hours per day, the cost amounted to a trifle over $10 per joint. In another instance, in brick paving, where travel was light and track conditions fair, the cost amounted to $7.32 per completed joint. This year, however, we expect to handle this work much more economically, since last year was practically our first experience in the use of cast welding. E. H. BERRY, Engr. Roadways,
Cincinnati Tract. Co.

I 28.—What is a good method of testing rail-bonds?

We have just put into use a bond-testing car of very simple design that has given very good results. The car was an old horse car overhauled for the purpose. For a load we made a rheostat of about 2.6 ohms capacity, taking 200 amps. at 525 volts, at a temperature of 450 degs. F. The resistance consists of 1440 ft. of common wrought iron, 1-16 in. x 1¼ ins., mounted by winding in ten sections, each section 4 ft. long, 35 lengths per section. The sections were mounted on ½-in. round iron rods, held in a framework, made of 2½-in. L iron. For insulation we used special micanite tubes. The bottom set of rods are held by six helical steel springs to take up the expansion of the iron resistances. The side bars, motor supports and brake rods of the truck are cut and joined by prepared oak blocks, thus insulating the front and rear wheels from each other. The current is led to the track through either pair of wheels, as the case demands, by using two S. P. switches. For taking the drop across the joints we suspend two contacts from each side of the car, between the wheels. For contact we use a metal-back brush with spring steel bristles. Contacts are spaced 36 ins. apart. From each set of contacts, leads go to a Whitney double millivolt meter



WIRING DIAGRAM OF BOND-TESTING CAR, CINCINNATI

with scales parallel. As one set of contacts is always across a section of rail, while the opposite is across a joint, the readings can be checked. Bad joints are marked by whitewash, which is carried in a tank under air pressure. The car is able to make 4 to 6 m.p.h. We are working on a relay to work the whitewash spotter automatically, which will enable the car to make faster time.

C. W. DE FOREST, Chief Eng.,
South Covington & Cincinnati St. Ry. Co.

ADDITIONAL QUESTION CONCERNING EMPLOYEES

B 22a.—A subscriber asks for information "on the policy of railway companies building houses to rent, or more particularly to sell, to their employees." Has any company tried this? What are your ideas concerning such a policy and how should the details be worked out? Expressions of opinion are particularly requested.

TROLLEY-RETRIEVER IMPROVEMENTS

The trolley retriever made by C. I. Earll, of New York, has been on the market since 1900, and is now in use on such lines as the Lakeside & Baldwinsville Railway; the Scranton division of the Lackawanna & Wyoming Valley Railroad Company; the Chevy Chase line of the Capital Traction Company, Washington, and the Fitchburg (Mass.) & Leominster Street Railway Company. The operating principles of this device, which contains a heavy spring for the retriever action and another for the rope slack, were described in the Street Railway Journal of Oct. 8, 1904, but a number of improvements have recently been added.

The resetting, which is now accomplished by merely taking hold of the rope without having to operate any pawls or levers, may be done either by a long continuous pull, in short strokes or stages, or by reciprocating the rope back and forth into and out of the retriever. The result of this important feature is that, after the pole has been pulled down and while the car is floating along at high speed, the conductor may take hold of the rope and bring the pole down close to the roof of the car, and then reciprocate the rope up and down until the retriever is "set" without danger of striking span wires while he is resetting and without hooking the pole down to the roof; at the same time he always has the assistance of the upward pull of the pole. This manner of resetting is illustrated in the accompanying cut, where *A* represents the position of the trolley on the wire, *B* the position to which it rises when the power spring is put into action to bring the pole down, and *C* the position to which it is brought down. Assuming that the trolley has jumped the wire and has been brought down to position *C* while the car is floating along at high speed, the conductor may take hold of the rope and pull the trolley down to position *D*, and then reciprocate it up and down from position *D* to position *E* until the power spring is full set, after which he may restore the trolley without stopping the car.

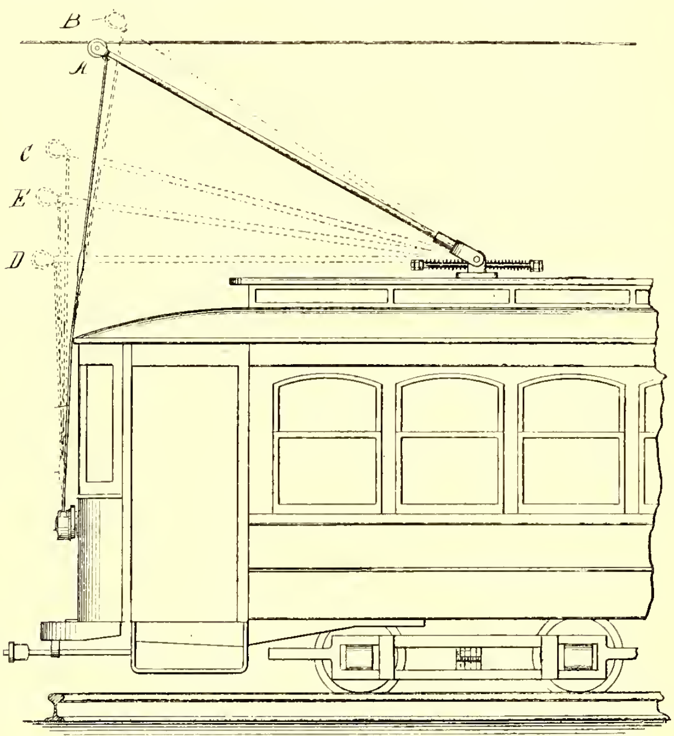
A very simple and effective means has been added to prevent the "rebound" or bob of the trolley after it has been pulled down. When the power spring of a retriever has been put in action it will pull the pole down until it and the trolley base springs are in equilibrium. To be effective in preventing damage, especially at high speeds, the pole must be brought down quickly, with the result that it will acquire a momentum sufficient to carry it to a point considerably below the position of equilibrium from which it will rebound, and this rebound, which often amounts to 1 ft. or 18 ins., reduces by just so much the effective clearance between the trolley and span wires.

A release has been provided by which, after the trolley has been pulled down and before the retriever is reset, the drum may be instantly released and the rope withdrawn to any extent. This is especially useful when switching a car from one track to another, in and out of car houses, etc., where it is not necessary or even desirable that the retriever should be set.

Although the release makes it possible to restore the trolley to the wire instantly and before resetting, the conductor cannot leave the retriever unset, because as soon as his hand is taken from the release lever the retriever will be in a condition in which it will take in slack rope, but will not let it out again until the resetting is completed.

All of these new features have been in actual service for over six months and are said to be popular, especially with conductors. No argument is necessary to establish the utility of retrievers for high speeds. At the lower speeds, however, there is some difference of opinion, principally because there is a notion among conductors that the bother of resetting the retrievers and changing it from one end of the car to the other is greater than it actually is. Conductors when using these retrievers on relatively slow-speed single-truck cars, find that when they are accustomed to them they can be handled as quickly and with as little inconvenience as where no retriever at all is used, and they soon learn to appreciate being relieved of the necessity of hurrying back through a crowded car to tend the rope at every curve, switch and crossing.

The Earll retrievers for high-speed interurban cars using a

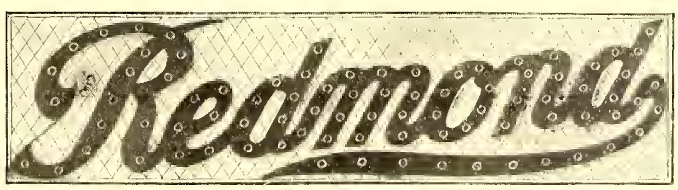


VIEW SHOWING THE MANNER OF RESETTING THE TROLLEY POLE

tension on the trolley rope up to 45 lbs. are 7¾ ins. external diameter and project 5½ ins. from the dash, and weigh 17 lbs., and will take in 24 ft. of No. 10 rope, so that No. 12 rope may be used where desired, while for slower speed city cars using a tension on the trolley rope of from 16 lbs. to 25 lbs. or 30 lbs., the retrievers weigh about 14 lbs. and project about 5 ins. from the dash.

METAL ELECTRIC SIGNS

Many users of electric signs fail to realize that it pays to install a sign first-class in every respect rather than a cheap illegible representation that wastes current and soon falls into a state of decrepitude. Legibility and durability are the prime qualifications required, and as these points have always been borne in mind by the Haller Machine Company, of Chicago,



A METAL ELECTRIC SIGN

that company has succeeded in developing a very extensive line of high-grade metal signs and letters.

The signs made by this company are wired complete ready for hanging and connection to the circuit. They are elegantly finished with appropriate raised and embossed ornaments and moldings finished with gold, and are excellent day signs as well as night signs. The letters, background and ornaments are of metal, all in one piece, so that no part can work loose. These signs and letters will not warp, shrink or become dilapidated like wooden or compounded signs, but are so durable that they should remain in perfect condition for a lifetime. Despite their substantial construction, they are said to be surprisingly light in weight.

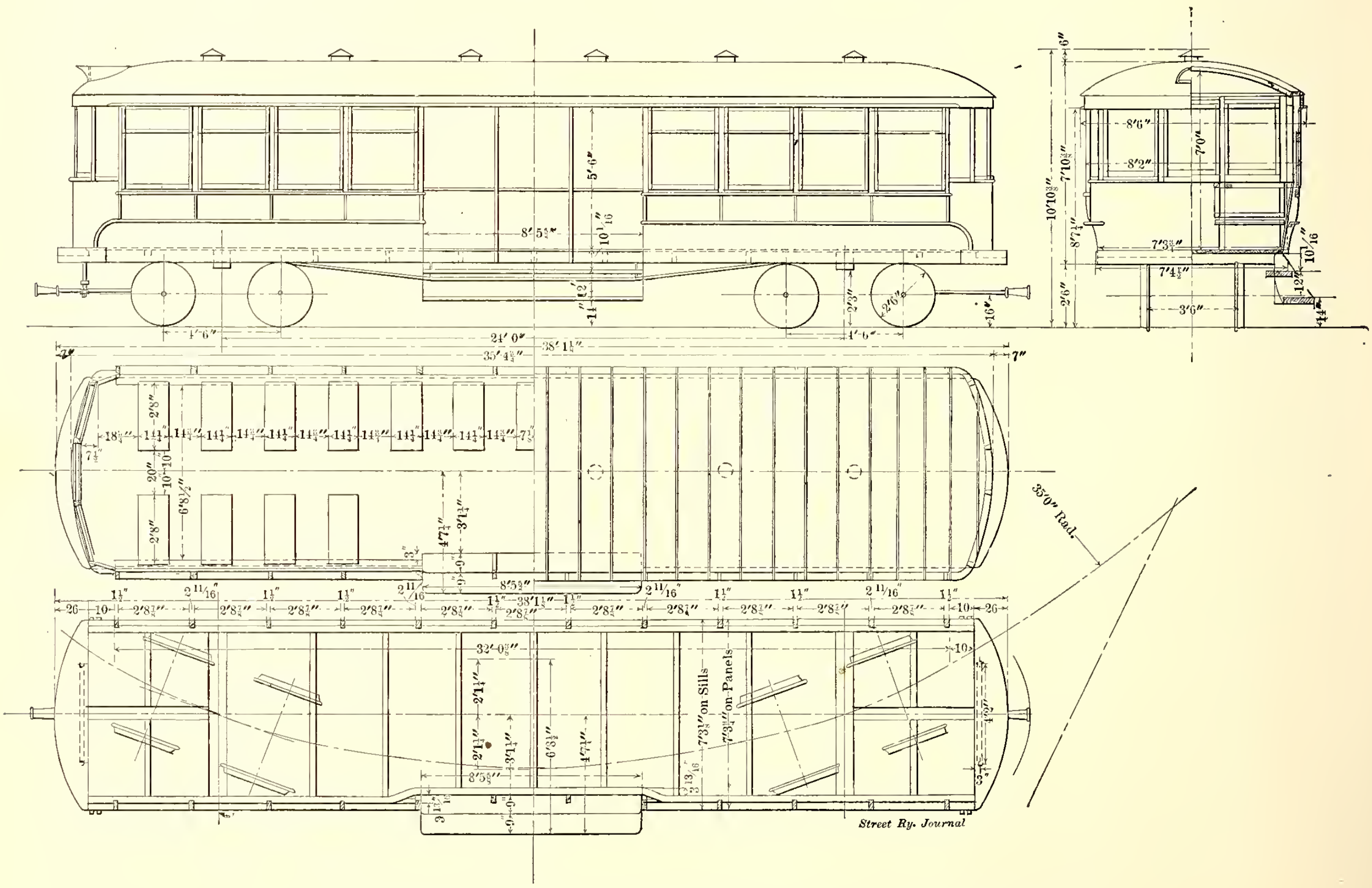
The metal box letters for electric signs are made of heavily galvanized sheet steel and carefully braced inside. They are studded with special keyless porcelain Edison base lamp receptacles or sockets, with removable copper shells, and are wired for circuits of from 50 volts to 600 volts, with rubber-covered copper wire. Provided with ears or bolts, they are ready to be attached to sign boards, steel frames, wire screens, walls, etc., or to be distributed in show places. Besides the letters and signs described, this company has many other designs that are widely installed. It is also largely interested in the manufacture of other metal specialties, such as changeable bulletin boards, flashers and time switches, foot and border lights, special reflectors, etc.

C. O. Scranton, passenger agent of the Stark Electric Railway, is doing some good work for his company by organizing a Chautauqua Assembly, to be held at Lake Park, the company's pleasure resort near Alliance, for two weeks, in July and August. He secured the backing of prominent church people, and is taking charge of the arrangements, advertising, etc. Tents will be rented to visitors and meals furnished at the company's park restaurants. The money received from the sale of season tickets will be used for current expenses in connection with the management of the Chautauqua, and anything remaining will be placed in the treasury as a fund for perpetuating the event annually. The company will make special excursion rates to those who join the assembly. The programme will consist of lectures and concerts, and there will be illuminations of fireworks, lanterns, etc., together with several baseball games by way of recreation.

NEW FIVE-TON DOUBLE-TRUCK TRAILERS FOR THE DENVER CITY TRAMWAY COMPANY

The Denver City Tramway Company is going extensively into the use of trailers on some of its lines during the rush hours morning and evening. These trailers are attached to double-truck four-motor cars. The trailers heretofore run have principally been light cars formerly used for cable service. Twenty-four seven-bench single-truck trailers of this kind are now in use. These weigh about 5750 lbs. and seat thirty-five people. The running boards have been taken off the left side of these cars, as trains run around loops or Ys at each end of a trip.

Five new trailers are now being constructed at the works of the Woeber Carriage Company in Denver. The notable thing about these trailers is that, although they are double-truck cars, 38 ft. over all, the weight is to be kept down to 10,000 lbs. The general arrangement of these trailers, which is similar to that of the company's standard motor cars, is shown in the accompanying drawing. They have center entrances 8 ft. 5 ins. wide. The front of the car is a closed compartment, and the rear can be either open or closed as far as the windows are concerned, but it is always open at the entrances, as there is no partition between it and the entrance. As will be noticed, the strength of the car bottom is mainly in the longitudinal side sills. These side sills are of I-beams reinforced with wood. On the step side the I-beam is bent slightly inward and trussed, so that the steps need not project as far as if the edge of the top step were even with the side of the car. These trailers are to be equipped with straight air brakes. The train pipe to the trailer runs from the motorman's valve independent of the pipe supplying the brake cylinder of the motor car, thus should the hose break or part between the motor and trailer, the motorman could stop the train with the motor car air brake, the air being shut off from the trailer pipe.



LONGITUDINAL AND END ELEVATIONS AND PLANS OF DENVER TRAIL CAR

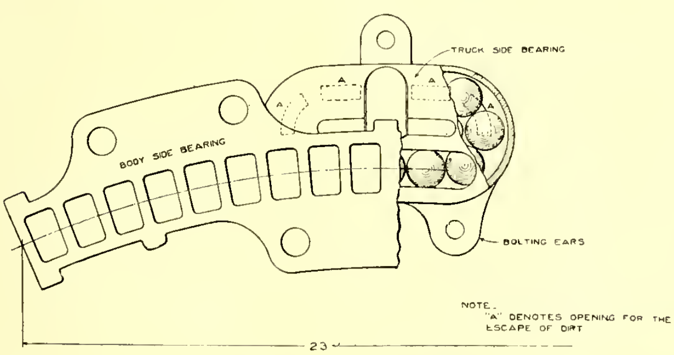
One object in the use of trailers in Denver, according to S. W. Cantril, superintendent, is the possibility of carrying a large number of passengers during rush hours without keeping such a large list of extra motormen.

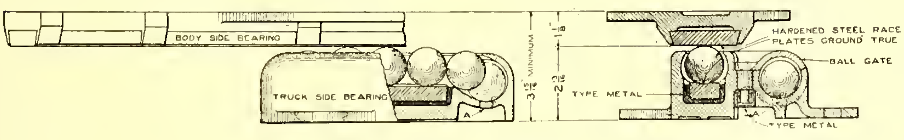
CENTER AND SIDE BEARINGS FOR RAILWAY TRUCKS

In the standard trucks of to-day the center bearing is the only pivot point between the truck and the car, and must turn when curving, or derailment will result. In fact, the friction is so great that a minimum pressure of about 1200 lbs. is required against the flange of the wheel to move the ordinary center plate under a load of 72,000 lbs.; usually this minimum pressure required is far exceeded. The necessity of exerting this force at the wheel flanges must take a large percentage of the power. This strain is applied to the center plate through the truck frame acting as a complex lever, which racks and wrenches the truck, and is the cause of broken and worn flanges, worn-out rails and wrecks.

The desirability of obviating the greater part of the losses in power caused by this feature in truck design has led to the invention of various types of bearings, among which are the Baltimore center and side bearings made by the Baltimore Railway Specialty Company.

A recent test with the style B center bearing made by this company has proven that only 150 lbs. pressure against the flange of the wheel is required to turn a truck under a load of 72,000 lbs. The bearing contains eighteen balls having a crushing resistance of 100,000 lbs. each. Two of these center bearings under a loaded car weighing 144,000 lbs. would only mean an average strain of 4000 lbs. per ball. The ball race plates are made of a superior quality of steel and subjected to special treatment to obtain the requisite degree of hardness. These plates are ground absolutely true in the groove on special grinding machines, insuring an equal distribution of weight to each ball. The boss of the lower plate is machined and fits closely into the machined recess of upper plate, preventing displacement when cars run together, as in coupling, etc. The balls

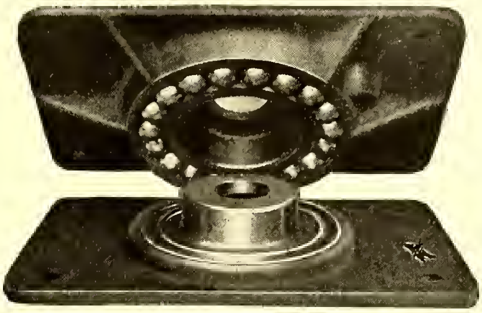




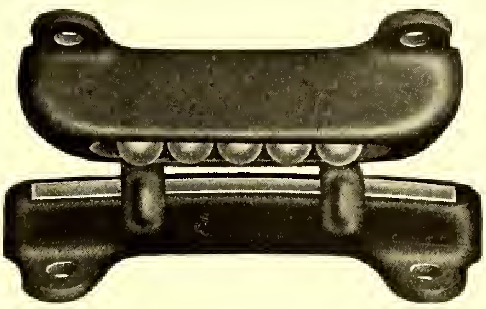
DETAILS OF STANDARD SIDE BEARING FOR ELECTRIC CARS

working in grooves, resist lateral motion and give a broad wearing surface. All parts are machined to fit and are interchangeable. By renewing the wearing parts, the cost of new bearings is saved when rebuilding cars.

The large use of the double-truck car has developed a serious trouble, namely, the grinding away of rails, switches and wheels on the numerous short curves of electric lines. On many roads rails and switches have to be replaced every month. Investigation will prove that these evils are due to the friction between the car and truck. The Baltimore center and side bearings, it is claimed, will reduce this friction to a minimum and will save their cost many times over in the life of the car. The company has found by test that a car equipped with these bearings rounded the sharpest curve on a grade with the starting lever in the first notch, while full power was required to pull a car of the same weight equipped with ordinary bearings through the same curve.



CENTER AND SIDE BEARINGS



SUSPENDED BALLS, LATERAL ADJUSTMENT

The side bearing, style S, shown in the accompanying sectional views, has been designed especially for electric cars. The travel on the lower bearing is unlimited, and on the upper bearing is 26 ins., but can be made more if desired. It contains twelve 1¼-in. high-duty steel balls, specially treated race plates, ground absolutely true, insuring an equal distribution of weight to each ball in service. The bolting arrangement of the lower bearing can be designed to suit the bolsters. The upper bearing plate has a broad flat surface for the balls to roll on, which provides for inaccurate location and different radii. The balls in service have sufficient side movement to allow for lateral motion. The side bearing, style Sa, made by this company as a universal bearing for Brill maximum traction trucks, is like style S, except that the lower bearing has extended ends with double sockets for truck spring posts. Right and left castings are not necessary, as the double sockets provide for the use of the lower bearing on either side of the truck.

A RECORDING VOLTMETER FOR BOTH DIRECT AND ALTERNATING CURRENTS

In the application of electric power, as, for instance, on an electric railway, it is of great importance that the voltage be maintained regardless of the variations in the load. The recording voltmeter has proven itself to be of great value, and is an indispensable part of a modern electric plant, since it accurately, automatically and continuously furnishes a written record of the slightest variation of the voltage. The recording voltmeters manufactured by the Bristol Company, of Waterbury, Conn., have been extensively adopted, but up to the present it has been necessary to furnish the instruments with entirely different current coils, according as they were to be employed upon alternating or direct-current circuits. In many electric plants both alternating and direct current are generated, and if the same voltmeter can be used equally well for recording either kind of current, it is quite evident that a valuable advance has been made.

This has been accomplished by the Bristol Company, and

Fig. 1 illustrates the standard station or switchboard design. In Fig. 2 a special portable form of the instrument is shown. The case is provided with a handle and leveling screws for convenient transportation and adjustment. The door is open, showing the construction and manner of operation.

The novel features and improvements to this new voltmeter are: First, it is equally applicable to both alternating or direct circuit; second, it requires only one-third as much current to operate as that necessary for the older design for alternating currents; third, it is more sensitive to very slight variations of voltage; fourth, the chart graduations are nearly uniform on both sides of the working range; fifth, the portable form of the instrument in its carrying case is only half the size and weight that was formerly required.

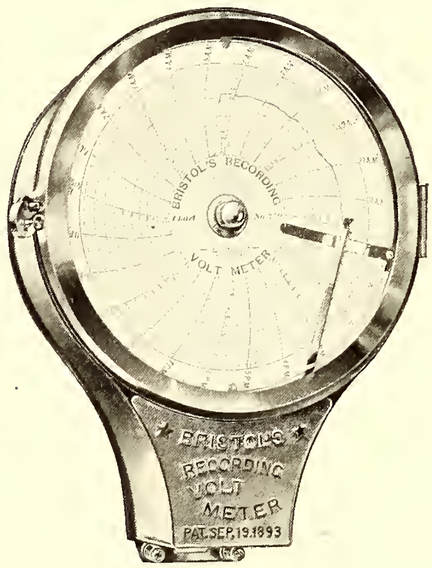


FIG. 1.—SWITCHBOARD TYPE OF RECORDING VOLTMETER

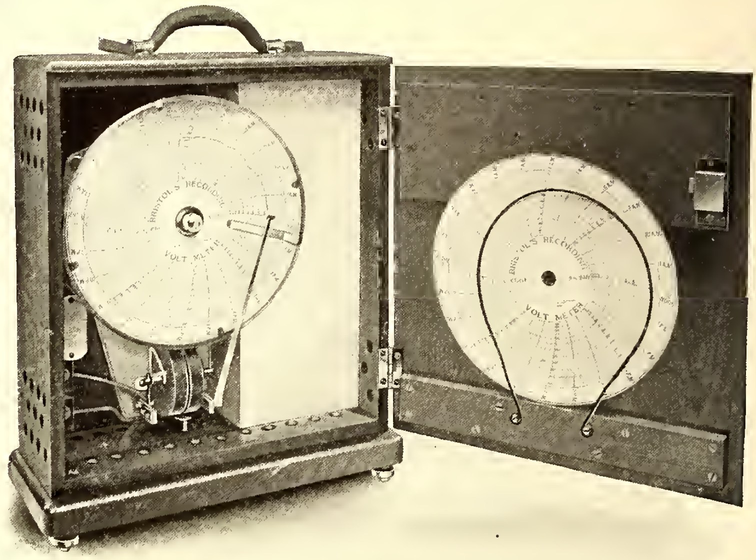


FIG. 2.—PORTABLE TYPE OF RECORDING VOLTMETER FOR A. C. AND D. C. CIRCUITS

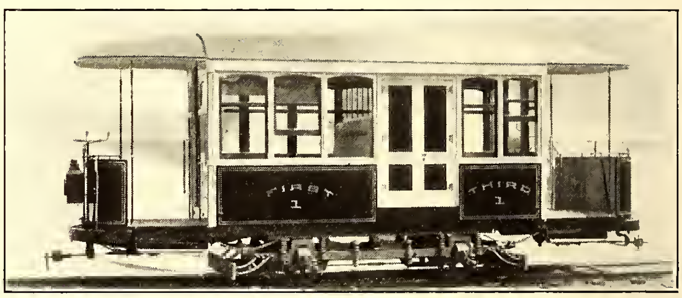
The solenoids shown in Fig. 2 are connected so that when current is passing through them in series the movable solenoid will be repelled from, instead of being attracted toward, the stationary one. The movable solenoid is mounted on a frictionless knife-edge multiplying device, which transmits its motion to the pen arm, carried by the knife-edge blade. This simple multiplying device permits the solenoids to be located very near each other, and consequently the magnetic field of force is uniform throughout the motion of the solenoid, resulting in the desirable scale divisions of the chart. By making the constructions of the solenoids so that there is repulsion instead of attraction, the mutual inductance between them is neutralized, thus making the same instrument suitable for recording either alternating or direct current. The instrument is independent of the rate of alternations and is compensated for changes of atmospheric temperature.

On May 1 a limited train service was instituted on the Rochester & Eastern Rapid Railway between Rochester and Geneva, N. Y., 44 miles. Five limited trains, called "Orange Limiteds," run each way daily, making only three stops and the run in one hour and forty-five minutes, which is less than the schedule of the fastest train on the competing steam line. The cars used on these trains have been renovated and interiors redecorated. All forms of regular tickets and mileage are good, but in addition each passenger is required to present a limited train ticket costing 10 cents, irrespective of distance. These trains, notwithstanding the short time they have been in operation, are being liberally patronized, and their success is assured.

SEMI-CONVERTIBLE CARS FOR SOUTH AFRICA

A shipment of cars of the interesting type illustrated has lately been made to the Cape Government Tramways, Cape Town, South Africa, by the J. G. Brill Company. The cars are divided into three compartments, the first-class one being 6 ft. 9⅛ ins. long and seated for seven passengers, the third-class being 3 ft. 9⅛ ins. long and seated for four passengers, and the compartment in the center for luggage, 3 ft. 6¾ ins. The cars have the builder's semi-convertible window system. This arrangement has already been used in South Africa, as several of the full convertible cars from the same maker have been in operation for over a year. The end sashes are stationary. The luggage compartment has doors on each side opening outwardly. The first-class compartment is finished in cherry and the seats are of spring cane, while the third-class compartment is finished in ash and has slat seats. The ceilings are of birch, and are decorated in the first-class compartment.

The cars are 15 ft. over the end panels and 24 ft. 6 ins. over the crown pieces. From the panel over the crown piece is 4 ft. 9 ins. The width over the sills and sheathing is 6 ft. 4 ins. The side and end sills are 3¾ ins. x 7⅞ ins.; thickness of the corner posts, 3¾ ins., and of the side posts, 2¾ ins. The trucks are of the No. 21-E type, with 6-ft. 6-in. wheel base and 33½-in. wheels. The equipment includes angle-iron bumpers, radial draw-bars, "Dedenda" gongs, ratchet brake handles, etc.



A NOVEL CAR FOR THE CAPE GOVERNMENT TRAMWAYS

About forty new cars, of the type described in the STREET RAILWAY JOURNAL of May 6, for use on the surface and elevated lines of the Brooklyn Rapid Transit Company, have been received in Brooklyn.

THE OFFICIAL OPENING OF THE MANILA SYSTEM

Accounts are to hand of the ceremonies attending the opening of the Manila Electric Railway to traffic on Monday, April 10. The day was a general holiday, and the city was decorated with flags and bunting. Everywhere there was good cheer, and as the first car, elaborately decorated as shown in the accompanying engraving, made its way at a little after four o'clock from Santa Ana to the Escolta, the populace turned to salute it. There were formal services at the Ayuntamiento, at which were present General Manager Laffin, Engineer H. A. Belden, Commissioner Forbes, Secretary Ferguson, P. G. McDonnell, T. C. McKinney and others. After speeches by Thos. C. Kinney, of Pillsbury and Sutro, the representatives in Manila of J. G. White & Company, who built the road, and Mr. Laffin, the party went over the lines in the special car.

"The value of an extensive modern electric car line to this city can hardly be overestimated," says the Cable News of Manila. "The city is one of long distances, and one of the most vexing problems of life here has been that of getting about the place. Our heretofore methods of public travel have been either very expensive, or abominably bad; and between the two most people have been compelled to maintain a small livery stable at large expense. The cochero, public and private, has been the tyrant of life in Manila, but to-day marks the end of his career.

STARTING OFF THE FIRST ELECTRIC CAR IN MANILA

"Not the least of the good results of the system will be the social leveling of all classes and conditions of people. When one's standing is judged by the sort of carriage in which one rides, all sorts of petty and unwholesome distinctions arise, and a tendency to arrogance and exclusiveness is developed which is detrimental to the public spirit of a progressive people. The car line will do much to keep us all on the ground together."

The system was fully described in the Street Railway Journal of April 29.

MEETING OF THE REORGANIZATION COMMITTEE OF THE AMERICAN STREET RAILWAY ASSOCIATION

A meeting of the reorganization committee of the American Street Railway Association and its affiliated associations was held at the Bellevue-Stratford, Philadelphia, on June 12. There were present, as representing the American Street Railway Association, Messrs. Ely, Penington, Goodrich, Harrington, Beggs, Stanley and Prof. Norris. The Accountants' Association was represented by W. G. Ross, the Mechanical Association by H. H. Adams, and the Claim Agents' Association by W. H. Renaud. President Parsons, of the Philadelphia Rapid Transit Company, attended the meeting, and said that he would do anything in his power to make the September convention a success. Several representatives of the Manufacturers' Association were also present at the meeting.

The report of the sub-committee on reorganization, which was published in the Street Railway Journal for April 15, was carefully considered article by article. The general scheme was approved, but a number of minor changes were made. One of these was in the proposed name of the association. After considerable debate between the relative advantage of "American Electric Railway Association" and "American Street and Interurban Railway Association," the latter was selected for presentation to the association at its Philadelphia meeting. Upon conclusion of the revision of the report the president appointed Messrs. Penington, Norris and Crossman a committee to draft the wording of the proposed changes and submit the revised constitution and by-laws again to the committee on reorganization for final approval. The dates of meetings of the several associations were selected as follows: Monday and Tuesday, Sept. 25 and 26, Mechanical Association and Claim Agents' Association; Wednesday and Thursday, Sept. 27 and 28, American Street Railway Association; Thursday, Friday and Saturday, Sept. 29, 30 and Oct. 1, Accountants' Association. The Bellevue-Stratford was selected as the headquarters, and the evening of Thursday for the banquet.

On Tuesday, June 13, the members of the executive committee, accompanied by William Wharton, Jr., of the manufacturers' committee on exhibit halls, visited the Philadelphia Museum. This building is located at the corner of Woodland Avenue and Thirty-Fourth Street, and is accessible in about fifteen minutes by electric cars on Walnut Street, Chestnut Street or the Fifth Street and South Street lines. This building is an immense structure, a part of which is now devoted to an industrial and commercial museum. The south pavilion, however, is unoccupied, and as much of it as is required will be available for the exhibits. The building adjoins the tracks of the Pennsylvania and Baltimore & Ohio Railroads, and a spur extends into the building. The sessions will be held on the second floor of this pavilion.

In the arrest of Mrs. Ellen Seivert, the secret service department of the Philadelphia Rapid Transit Company believe they have checked the career of another accident fakir. Mrs. Seivert is described as a grass widow, thirty-five years old. It is said that Mrs. Seivert is a sickly woman, and that this has aided her materially in mulcting the Atlantic City Railway out of $200, the Reading Railroad and other companies. In January, 1904, Mrs. Seivert had a claim of $25 allowed by the Philadelphia Company in settlement of an accident said to have been received at Fifteenth Street and Girard Avenue. On June 6 of the same year she presented another claim, posing as Mary King. Her claim this time was that she had been thrown from a car at Seventeenth and Market Streets. On being visited at her home by an agent of the company, she became suspicious and fled to Atlantic City. Her arrest followed.

FINANCIAL INTELLIGENCE

WALL STREET, June 14, 1905.

The Money Market

There was no appreciable change in the money market this week, rates and conditions remaining practically the same as those prevailing for some time past. In the early part of the week the market displayed a firmer tendency, local bankers and individual lenders being disposed to advance the interest charges on time loans in view of the heavy disbursements to be made on July 1, but the liberal offerings of foreign money against the sale of long sterling bills, and the announcement from Washington that the Secretary of the Treasury had decided to postpone the payment of the remaining 25 per cent of Government deposits until July 15, caused a decline in rates for all maturities to the previous low level. Money on call was in abundant supply throughout the week, at rates ranging from 3 to 2¼ per cent, the bulk of the business being transacted at 2½ per cent. Time contracts were in better demand, and borrowers experienced little difficulty in obtaining accommodation. Early in the week ninety-day loans were placed at 3¼ per cent, but subsequently the quotation declined to 3 per cent with moderate offerings at that figure. Six-month contracts were also obtainable at 3½ per cent, and over the year maturities could be had at 3¾ per cent. Commercial paper continued quiet, the volume of business still being restricted by the extremely light offerings of choice material. Rates ruled unchanged on the basis of 3¾ to 4 per cent for the best names. Sterling exchange remained steady and practically unchanged at 4.87 for prime demand bills, the advancing tendency heretofore noted being checked by the liberal offerings of finance bills. The bank statement was better than had been generally expected. There was a further contraction in loans of $11,762,200. Cash increased $616,000, and deposits decreased $12,644,900. Reserve required was $3,161,225 less than in the preceding week, resulting in an increase in the surplus reserve of $3,777,225 to $9,827,500 against $35,562,400 in the corresponding week of last year, and $9,477,175 in 1903. The amount of United States deposits is $12,731,700 against $12,768,500 in the preceeding week.

The European market ruled easy. The discount rate at London was 2 per cent. At Paris the rate was 1½ per cent, and at Berlin 2¼ per cent.

The Stock Market

The stock market was extremely dull this week, and apart from temporary reactions resulting from profit-taking sales, the general tone was firm. The outside demand for stocks was very small, and operations for the most part were of a purely professional character. In the early dealings prices displayed more or less irregularity, but subsequently the market was influenced by the developments in the affairs of one of the leading insurance companies, the improvement in the foreign situation, the peace negotiations, and the progress of the crops; railway gross earnings were also extremely favorable, substantial increases being shown over those for the corresponding period of last year, and there was less apprehension regarding the course of the money market in the near future. The most important factors were the favorable turn in the affairs of the Equitable, having as it does a direct relation with the investment situation, and the peace movement inaugurated by President Roosevelt, which will have a greater influence when the negotiations have made further progress. A feature of the week was the reduction in the floating supply of stocks by purchases for the account of the larger interests. The steel stocks were strong, and advanced on buying, said to be for banking interests identified with the company. Amalgamated Copper was rather weak, owing to the renewed attack by a Boston operator. The decline in American Steel Foundries was the result of forced liquidations, and some doubt as to the declaration of a dividend next month. The railroad issues were firm under the lead of Union Pacific, St. Paul and Atchison. The coal roads showed considerable strength, especially Reading, which advanced sharply on talk of an increased dividend on that stock. The bond market was fairly active and strong, the overshadowing feature being the absorption of the Japanese Government issues. The closing was strong.

The traction stocks were exceptionally strong, especially the Metropolitan issues, on the report that a syndicate of Metropolitan interests had been formed with $100,000,000 capital to build new subways, franchises for which it is expected that the Rapid Transit Commissioners will grant to the Metropolitan interests.

Philadelphia

There was a decided improvement in the market for traction issues this week. Dealings were upon a somewhat smaller scale, but prices with few exceptions scored substantial gains over those prevailing at the close of the preceding week. Interest again centered largely in the speculative issues, and especially in United Gas & Improvement, which fluctuated sharply on moderate transactions. In the early dealings renewed pressure was brought to bear on this stock, which forced the price down a point to 93, but later on considerable strength developed, and on what was characterized good buying, the price rose to 96¾. In the final dealings, however, there was some disposition to take profit, which ended in a reaction to 95, where it closed, showing a net gain of 4½ points. Upwards of 30,000 shares were traded in. Philadelphia Rapid Transit was fairly active and irregular. At the opening there was rather heavy buying by shorts, which lifted the price from 27 to 28¼, but at the close the reports that the city administration intended to fight the recent trolley ordinance with a view of having them repealed, resulted in a rather heavy selling movement which carried the price off to 26½. The final transaction was at 27, unchanged from the previous week's closing price. About 25,000 shares were traded in. Philadelphia Traction remained strong throughout, all transactions taking place at 99½, an advance of ½. Philadelphia Company common was decidedly firm, the price rising from 42 to 43½ and closing within ¼ of the highest. Upwards of 6000 shares changed hands. The preferred stock was quiet and unchanged at 47½. Union Traction was quiet but strong. From 59½ there was an advance to 62. The close was at 59¾ ex. the dividend, which is equivalent to an advance of nearly 2 points. About 2500 shares of the stock changed hands. Other transactions included United Traction of Pittsburgh preferred at 51 to 50, American Railways at 50½, Consolidated Tractions of New Jersey at 83¾ to 82½, Fairmount Park Transportation at 18 to 16⅞, Indianapolis Street Railway at 113 and United Companies of New Jersey at 271½.

Chicago

There were no important developments in the local traction situation this week. Several conferences have been held to determine the price at which the lines will be turned over to the city administration, but so far as can be learned there has been no definite agreement as to term. A representative of the Chicago City Railway Company was quoted as saying that the lines will eventually be turned over to the city, and that the deal may go through very shortly.

Little activity developed in the local traction issues this week. Trading as a rule was confined to comparatively small amounts, but prices generally showed firmness. Metropolitan Elevated issues were particularly strong, the common advancing to 25½, while the preferred rose to 65¾. It was stated upon good authority that there will be no dividend on the preferred stock before the end of the present fiscal year. It is understood that the company is reducing its collateral loan, which becomes due in October, and which is secured by extension bonds. South Side Elevated also enjoyed a substantial advance from 93 to 95½. Northwestern Elevated opened at 22½ and advanced to 23½, but later broke to 21½, with a subsequent call at 22. The preferred advanced from 60 to 61. Chicago & Oak Park brought 21, and a small lot of West Chicago brought 40.

Other Traction Securities

The Baltimore market was fairly active and firm. United Railway stock, trust receipts, sold at 14½ and advance 2¼, while the free stock brought 14 to 14¼. The 4 per cent bonds rose ½ to 93¼ on the purchase of about $20,000, while the income broke from 62¼ to 60⅛ on sales of about $150,000. North Baltimore Railway 5s were firm, $10,000 changing hands at 119¼. Other transactions included $10,000 Washington City and Suburban 5s at 106, $3,000 Norfolk Railway & Light 5s at 92, Macon Railway & Light 5s at 99, $5,000 Virginia Electric Railway and Development 5s at 98, Baltimore Traction 5s at 110½, City & Suburban 5s at 113 to 113⅛ and $12,000 Augusta Street Railway & Electric 5s at 104. Extreme dullness prevailed in the Boston market, the principal feature being an advance in West End common to 97½ at light purchases.

The preferred advanced ½ to 116½. Boston Elevated ruled steady with sales of small amounts at 157¼ to 157. Other sales included Massachusetts Electric common at 17 to 16½, preferred at 58½ to 59. Boston and Worcester at 30, preferred at 77½, Boston and Suburban at 67½. In the New York curb market, Interborough Rapid Transit was actively dealt in at practically lower prices. From 205 at the close of the previous week, the price ran off to 201½, and closed at 202½ ex. the dividend of 2 per cent. About 9000 shares were traded in. New Orleans Railway issues continued strong, both the common and preferred establishing new high records for the year, the first named advancing from 37¼ to 38⅝ in the exchange of about 2500 shares, while the preferred rose from 77 to 80½ on the purchase of 3500 shares. The 4½ per cent bonds were also firm, $104,000 changing hands at from 92½ to 90¼ and interest. Washington Railway preferred sold to the extetnt of 500 shares at 90.

Cincinnati, Dayton & Toledo securities featured at Cincinnati last week. The granting of a blanket franchise in Hamilton will eventually strengthen the line somewhat. The common stock advanced to 23½ and 5 per cent bonds sold at 92½. Southern Ohio 5s, an underlying issue, sold at 98¼. Other active issues were: Detroit United 90¾; Cincinnati Street Railway, 148½; Toledo Railway & Light 34½; Cincinnati, Newport & Covington common 42¾ and preferred 93.

Northern Texas Traction featured in Cleveland. The property has been making remarkable gains of late and the stock is eagerly sought for on prospects of an increased dividend. Several lots sold at 58¾. Detroit United sold at 90. Northern Ohio Traction sold at 22 for a small lot, but early this week advanced to 22½ on rather heavy buying. Aurora, Elgin & Chicago was active at 15⅞ to 16. Elgin, Aurora & Southern, which has been inactive for a long time, sold at 25 for a small lot. Aurora, Elgin & Chicago bonds advanced to 90¾ on sales of $63,000 worth. Northern Ohio 4s sold at 69½ to 70¼ on sales of $22,000 worth. Western Ohio bonds were active at 78 to 78½. Miami & Erie Canal bonds reached a new low mark of $7.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks and the active bonds, as compared with last week:

	June 7	June 14
American Railways	50	50
Boston Elevated	156¾	156
Brooklyn Rapid Transit	62¾	64
Chicago City	—	—
Chicago Union Traction (common)	6	5⅞
Chicago Union Traction (preferred)	30	—
Cleveland Electric	—	79⅝
Consolidated Traction of New Jersey	83	82
Consolidated Traction of New Jersey 5s	109	108½
Detroit United	89½	91¼
Interborough Rapid Transit	201½	*201
International Traction of Buffalo	25	25
International Traction of Buffalo (preferred)	60	60
International Traction of Buffalo 4s	82½	82½
Manhattan Railway	163	163
Massachusetts Electric Cos. (common)	16	17
Massachusetts Electric Cos. (preferred)	58½	58
Metropolitan Elevated, Chicago (common)	23	23½
Metropolitan Elevated, Chicago (preferred)	64½	64½
Metropolitan Street	118⅞	122⅞
Metropolitan Securities	77⅝	79¾
New Orleans Railways (common), W. I.	37	38¼
New Orleans Railways (preferred), W. I.	77	80
New Orleans Railways 4½s	90⅛	90¼
North Amcrican	98	97½
North Jersey Street Railway	—	25
Philadelphia Company (common)	42	42½
Philadelphia Rapid Transit	27⅛	26¾
Philadelphia Traction	99¾	99½
Public Service Corporation 5 per cent notes	97	97
Public Service Corporation certifictes	69½	69
South Side Elevated (Chicago)	—	94½
Third Avenue	126	127
Twin City, Minneapolis (common)	110¾	109¾
Union Traction (Philadelphia)	60½	*59¾
West End (common)	96¾	97
West End (preferred)	116	116½

a Asked. W. I., when issued. * Ex-dividend.

Iron and Steel

The "Iron Age" says nothing has occurred during the past week to materially change the attitude of buyers and sellers in the iron trade as a whole. The larger consumers of raw materials seem to be well covered for some time to come, and the producers show little disposition to force material on an unwilling market, particularly since they have contracts to take care of their output for months. Still the market is in buyers' favor in pig iron and prices are slowly receding. Steel billets are easier in the leading markets. The activity in structural material continues. Plate mills are active. The export trade is being pushed more vigorously. Export wire trade continues to be active.

B. R. T. TO APPEAL FRANCHISE DECISION

President Winter, of the Brooklyn Rapid Transit Company, is quoted as saying that the decision of the Appellate Division of the Supreme Court, that the company has lost its franchise to build tracks and operate a line on Saratoga Avenue by its failure to use the franchise for five years, will be carried to the Court of Appeals at once. The decision was of such a general character that it affected practically all of the minor franchises held by the company and would, if sustained by the higher court, shut the Brooklyn Rapid Transit off from building railroads upon any of nearly a hundred streets extending over two hundred miles.

SALE OF NEW ORLEANS PROPERTY

An ancillary decree of foreclosure, signed by Judge Pardee, June 5, was filed in the clerk's office of the United States Circuit Court a few days ago, ordering the sale of the New Orleans Railways Company's property in the matter of the suit of the New York Security & Trust Company vs. the New Orleans Railways Company. This decree is similar to that rendered in the suit filed originally in the United States Circuit Court in New Jersey. Six interventions, all claims for damages for injuries received, were filed in the United States Circuit Court in the suit of the New York Security & Trust Company, the claims aggregating $4,300. The property will be advertised for sale within a day or two. The new company will be chartered under the laws of the State of Louisiana, and the charter will be published in a few days.

KANSAS CITY & LEAVENWORTH SOLD

Fisk & Robinson, of New York, have purchased the stock and bonds of the Kansas City & Leavenworth Electric Railway, and will change the name of the company to the Kansas City Western Railway. The purchasers inform the Street Railway Journal that this is the only announcement concerning the purchase that they desire to make at this time.

MOOTED WIDENER-ELKINS CONSOLIDATION

There are numerous indications that the Widener-Elkins syndicate is working its plans for leasing or consolidating the most important lines in Ohio and Indiana along the lines set forth in a recent article in the Street Railway Journal; several important developments having been lately announced. The "Cincinnati Enquirer" of June 12 contains an interview with W. Kesley Schoepf, in which he is quoted as saying that the syndicate has acquired control of the Indianapolis & Eastern Railway, one of the links in the chain of lines between Indianapolis and Dayton. Reports from Richmond, Ind., indicate that the Richmond Street & Interurban Railway, another link in this chain, has also been acquired. Conferences were held at Lima last week at which time it was announced that leases had been arranged at the Lima Electric Railway & Light Company, operating the city lines in Lima, and on the Lima & Toledo Traction Company, which is building a line from Lima to Toledo. There are reports of other transactions, but nothing authentic.

The Lake Shore Electric Railway is working up considerable business out of Cleveland and points along its line for points in the southwest and west, tickets being sold over the "Clover Leaf" to St. Louis and over western roads from that point. The western roads have never made any ruling against traction lines, and the possibilities for low rates by means of the connection with the "Clover Leaf" is opening up quite a little business for this progressive traction line.

THE BALTIMORE, NASHVILLE & ANNAPOLIS—BIDS WANTED

An ordinance has been introduced into the Baltimore City Council authorizing the Washington, Baltimore & Annapolis Electric Railway Company to construct a connecting link with its line so as to give direct access to that city at Baltimore Street and Hopkins Place. The company has a private right of way 31 miles long between Baltimore and Washington, and this is said to be the shortest route between the two cities. It is the intention of the Ohio syndicate in control of the property to furnish a high-speed service between Washington and Baltimore, and the cars will practically travel on railroad time at intervals of every 15 minutes, covering the distance from the center of Washington to the center of Baltimore in 60 minutes. The road will be built with a strictly terminal service in view and most of the trains will run on an express schedule. Few local trains will be operated, the territory not being thickly settled. The route of the new Washington, Baltimore & Annapolis Electric Railway will run east of the Pennsylvania Railroad between Baltimore and Washington, and from Chesapeake Junction to a point within 8 miles of Baltimore will parallel that railroad. From this point to the city the new line will run parallel with the Baltimore & Annapolis short line. Besides building and operating the Washington, Baltimore & Annapolis line the company will also operate the Washington, Berwyn & Laurel line, which it owns. This line runs from Berwyn to Laurel. At Berwyn it connects with the City & Suburban Railway of Washington, by which route it enters the capital. The gap between Laurel and Annapolis Junction will be built. The company also owns the Annapolis, Washington & Baltimore Railroad, which is now operated as a steam line. This road runs from Annapolis Junction, where it connects with the Baltimore & Ohio, to Annapolis, crossing the Pennsylvania Railroad at Odenton.

The Roberts & Abbott Company, engineers, 1123 Schofield Building, Cleveland, Ohio, announces that it will receive bids for the grading and pipe culverts for the Washington, Baltimore & Annapolis Electric Railway. The grading to be contracted for is approximately 730,000 cubic yards, and the pipe culverts 1600 ft. of various sizes. Plans and specifications are now on file at the engineers' Cleveland office as well as at 801 Maryland Trust Building, Baltimore, Md. Copies will not be forwarded. The bids will be received at the Baltimore office address of the Roberts & Abbott Company, and marked "Proposal for the Washington, Baltimore & Annapolis," until 10 a. m., Friday, July 7. Data sheets for bidding will be furnished those who go over the route or otherwise make it evident that they will bid. Prospective bidders should preferably call at the Baltimore office.

AN ATTEMPT TO INCREASE FARES ON TWO OHIO LINES

Traction managers of Ohio are much interested in the outcome of the attempts of the Columbus, London & Springfield and the Dayton, Springfield & Urbana lines, Appleyard properties, to raise rates. As heretofore outlined in these columns, these roads, totogether with a number of lines leading out of Dayton, have acted upon the resolutions adopted by the Ohio Interurban Railway Association at its recent Cleveland meeting and have raised rates to approximately 2 cents per mile. In a few previous instances roads in this State have increased their rates, but have done so in a manner which did not conflict with so-called obligations assumed when franchises were granted. Frequently through rates have been raised, but local rates in a number of localities have been allowed to remain as provided for in franchise conditions.

The Appleyard properties were peculiarly unfortunate in that the original promotors established a base of 1½ cents per mile, and in a number of instances they agreed with County Commissioners and municipal authorities upon through rates which have resulted in loss to the companies. In one case the franchises provide that single and round-trip rates from Columbus to certain points and return shall be as specified. The grants say nothing about the rates from these points to Columbus and return, and the company justly takes the position that because it is compelled to live up to a bad bargain in one direction is no reason why it should be compelled to give the same rates in the other direction, and it has refused to accede to the demand of the Commissioners to hold to the old basis on these rates. It is quite probable that this case will lead to litigation. Traction men are inclined to the opinion that County Commissioners and municipalities are not authorized to fix rates except in their own bailiwicks. The lower courts of that State have decided that local Councils have no authority to fix rates on telephone charges, and cases on this point are pending in higher courts. It would seem that they have even less right to fix rates on railroads which cover long distances, particularly in view of the Interstate character which some of the roads are assuming. If these traction cases are fought out as expected, it will be of great importance to the traction interests of Ohio.

SUBWAY FLOODS IN NEW YORK AND BROOKLYN

The New York subway was tied up for 40 hours this week because of the bursting of a water main at Forty-Second Street on Sunday afternoon. Millions of gallons of water poured from the break into the tunnel. That section of the system between Thirty-Fourth Street and Thirty-Eighth Street suffered most. Here there is a deep cut, and engines had to be kept going for hours before the road was in a passable condition. The extent of the damage will only be known when a complete survey has been made of the section affected, and the work of making repairs has begun. General Manager Hedley of the Interborough Company was reported in Monday's papers as saying he thought the damages would reach $100,000. From the time of the break on Sunday afternoon until 3:25 o'clock a. m., on Tuesday, June 13, when through service was resumed, shuttle trains were operated north of Forty-Second Street and south of Fourteenth Street to the New Wall Street station. The entire section between Grand Central Station and Fourteenth Street thus was shut off. It took the subway officials four hours to find some one in authority in the department of water, gas and electricity of the city who knew where the flood gates were, and who had the authority to operate them. Meanwhile the water rushed into the tunnel. Had it been possible to turn off the water promptly, the damage would have been slight, and the public would not have been inconvenienced through the shutting down of an entire section of the road.

On Monday there was an accident in Brooklyn which tied up part of the surface and the elevated lines in that city. A subway is building in Fulton Street, where also is operated an elevated railroad. The latter is supported by temporary work. On the morning of the day mentioned, there was a heavy rain which flooded the new tunnel at Duffield Street. Underneath the street is a large sewer. This was unable to stand the pressure of the excessive flow of water, and it burst. The sewage washed through the cut with such force that it was feared the supports of the elevated had been injured and that the underpining of false street over which the surface cars are run also had been damaged. Traffic was entirely suspended until 3 o'clock in the afternoon, when both structures were declared to be safe.

MR. DALRYMPLE LEAVES FOR HOME

General Manager Dalrymple, of the Glasgow municipal tramways, who came to America on the invitation of Mayor Dunne of Chicago, to confer with that official as to the application in that city in connection with the scheme for municipalization of the local lines of methods that have made for success in Glasgow, has left Chicago for home. He visited Washington and Philadelphia on June 12 and 13. He is spending a few days in New York this week and will sail from Boston on Tuesday, June 20. A number of interviews, most of them unfounded, with Mr. Dalrymple have appeared in the daily press. It is understood, however, that he is greatly pleased with the efficiency of American systems, so far as he has seen them. He is quoted as saying that no extensive system can change uniform fares and give transfers under American conditions for less than a 5-cent fare, and that no street railway system can be operated successfully if politics have anything to do with its administration.

Mayor Dunne has been in conference with Mayor Johnson of Cleveland again. Accompanied by Clarence S. Darrow, his legal advisor, the Mayor returned to Chicago on Sunday after a two days' conference in Cleveland with Mayor Johnson, Professor Bemis, A. B. Dupont and others. As a result of this conference, the statement is made that Mr. Dupont has been tendered the position of manager of the Chicago lines in the event of their being taken over. This seems a little premature, but the attendance of Mr. Dupont at such a conference would likely result in the connection of his name with the Chicago proposition. Mr. Dupont, it will be remembered, was associated with Mr. Johnson in several of his projects when the latter was actively engaged in street railway work. He was at one time manager of the Detroit United Railway, and more recently was in charge of the operation of the St. Louis Transit Company.

Officials of the Chicago City Company are in conference in New York this week, and an announcement is expected to be made as to a proposition for the taking over by the city of the South Side lines.

GRADING THE MARION, BLUFFTON & EASTERN

Sealed proposals for grading and fence work for the Marion, Bluffton & Eastern Traction Company between Marion, Grant County, Ind., and Bluffton, Wells County, that State, will be received at the office of the company in Bluffton, up to noon of Saturday, June 24. Plans and specifications for this work are on file and may be seen at the office of the company at Bluffton, Ind. The company reserves the right to reject any and all bids. R. F. Cummins is secretary and F. F. VanTuyl, engineer of the company.

CHANGE OF GAGE IN EAST ST. LOUIS

Changing the gage of 20 miles of street railway track in one night, is the undertaking planned by the East St. Louis & Suburban Railway, which has begun work on the narrowing of its gage throughout the entire system. About 112 miles of track are to be changed, and 500 workmen are busy making the preparations. Seven miles of the rails are imbedded in concrete and this must be dug up before the removal can be effected. All of the lines of the East St. Louis & Suburban system except the branch from French Village to Lebanon are of standard gage. The company owns an electric coal road connecting East St. Louis and Belleville, which is standard gage. The officials now propose to change the rest of the system from 4 ft. 10 ins. to the standard 4 ft. 8½ ins. In the city of East St. Louis, where all the main lines converge, on the downtown loops, it is necessary that the new gage be installed over night. All the track will be prepared, the pavement removed, and some of the spikes loosened throughout the 20 miles. An army of men will be on hand, and as the last car passes over the rails on the night set for the undertaking, the workingmen will shift the rails an inch and a half closer together. Only a few hours will be available for this work, but the management believes that the task can be completed. A double-track system is being installed on the Denver side division.

STRIKE IN SAGINAW AND BAY CITY

On June 4 a strike was declared by the employees of the Bay City Street Railway, operating in Saginaw and Bay City, Mich., and an interurban line between the two cities. The trouble all came about over a demand by the men for an increase in wages, which the company did not feel that it could grant. The scale now is 17 and 19 cents for the city lines and 23 cents for the interurban line. The demand was for an increase to 21 cents as the maximum for the city lines and 23 cents for the interurban lines. More than 200 men are unofficially reported to have gone out. Service after the declaration of the strike was at first intermittent, as the strikers resorted to violence. So threatening did the attitude of a mob become in Saginaw on June 7 that the deputy in charge of the car fired into the people, killing one person and seriously injuring two others.

NEW SHOPS IN LOS ANGELES

It is reported that H. E. Huntington has decided to locate the main shops of the Los Angeles Railway Company on the 25-acre tract belonging to Mr. Huntington close to Eastlake Park. These buildings will cost between $200,000 and $300,000, exclusive of machinery to be installed therein. About two years ago Mr. Huntington decided to build the company's shops in another section of the city on a piece of land near the corner of South Park Avenue and Slauson Avenue. This idea was carried out to the extent of perfecting plans and beginning construction. All foundations have been laid and more or less of the detail work of the buildings has been completed. Officers of the company who had made estimates of the requirements for the shops were certain that they had calculated for all work that would be done for some years to come. But of late the increase of the company's business, the number of cars used and the development of traffic have been so enormous as to convince the management that the first site selected will be too small within a very short time. On this showing Mr. Huntington authorized the change of base to East Los Angeles. The buildings now under way on Slauson Avenue and South Park Avenue will be completed as car houses, with ample facilities for smaller repair work, but all the heavy work will be done at the proposed shops in East Los Angeles. It is estimated that the new shops will employ from four hundred to five hundred men.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED JUNE 6, 1905

791,575. Convertible Car; Michael Power, Toronto, Can. App. filed Dec. 3, 1904. Details of construction.

791,739. Brake Beam; Charles H. Williams, Jr., Chicago, Ill. App. filed Dec. 5, 1904. Provides a removable brake head, as well as a removable brake-shoe, and consists of means for readily removing and readjusting the same.

791,742. Street Car; Henry F. Vogel, St. Louis, Mo. App. filed Feb. 8, 1905. The tenons of a street car hand rod have non-circular shape and sockets therefor to prevent rotation thereof.

791,748. Switch Operating Mechanism; Elmer E. Campbell, Elwood, Ind. App. filed Dec. 27, 1904. A rotary disc in the road bed connected to the switch point by a link set out of center in the disc. Levers in the road bed in advance of the disc are connected by rods to the disc and also set out of center therein, so that when the levers are engaged by an approaching car, the switch will be actuated. A gravity latch for the switch and means for unlocking the same are also provided.

791,750. Trolley Retrieving Device; Henry B. Clarke, Oak Park, Ill. App. filed Sept. 3, 1904. The abnormal movement of the trolley pole in jumping from the wire operates to put pneumatic pole-controlling valves into operation.

791,760. Side Bearing for Cars; Robert L. Ellery, Portsmouth, N. H. App. filed May 20, 1904. The top plate of this bearing is constructed in two parts, one vertically slidable upon the other, so as to always maintain the two main parts of the bearing in contact with each other.

791,816. Current Collecting Device for Electric Cars. Leon W. Pullen, Philadelphia, Pa. App. filed July 18, 1904. Consists of two longitudinal pole-pieces connected at intervals by electromagnets, with insulating walls between them, flexible collector-bars suspended between the insulating walls, and insulating supporting devices for sustaining the collecting device upon the axles.

791,835. Trolley; Louis McD. Steele, Middletown, Ohio. App. filed Nov. 12, 1904. A pair of spring-pressed swiveled hooks mounted adjacent to the trolley wheel and adapted to close over the wire. These hooks are swung to one side by the hangers, and may be thrown out of operative position entirely by connections from the car.

791,854. Interchangeable and Reversible Brake-Shoe Head; Edward L. Aderson, Jr., St. Louis, Mo. App. filed Jan. 23, 1905. The object of this invention is to provide a brake-shoe head to which any of the well-known types of brake-shoes may be applied, and it consists of a brake-shoe head provided with a central opening, adapted to receive the fastening lug of a brake-shoe, and an opening at each end adapted to receive a brake-shoe key-bolt.

PERSONAL MENTION

MR. B. M. CHENEY has been appointed assistant to chief engineer Mr. Frank S. Cummins, of the Interurban Railway Company, of Des Moines, Ia.

MR. GEO. GOULD and MR. CHARLES T. YERKES were among the passengers on the "Kaiser Wilhelm II.," which sailed from New York on Tuesday, June 13.

MR. E. C. SPRING, president of the Ohio Interurban Railway Association and superintendent of the Dayton, Covington & Piqua Traction Company, is very ill at a hospital in Dayton. He is the victim of a sudden attack of fever.

MR. W. KELSEY SCHOEPF and MR. JOSEPH BENSON FORAKER, of Cincinnati, who are prominently identified with the properties of the Widener-Elkins syndicate in Ohio, recently made a 500-mile automobile trip inspecting the routes of lines projected by this syndicate.

MR. CONWAY F. HOLMES, formerly general manager of the Metropolitan Street Railway Company, of Kansas City, Mo., has been elected president and general manager of the Kansas City Western Railway, formerly the Kansas City-Leavenworth Railway, which is now controlled by Fisk & Robinson, of New York.

MR. JOHN W. BOYLE, formerly president of the Utica Belt Line Railway Company, of Utica, N. Y., has returned from a 20,000-mile tour of foreign lands, on which he started Nov. 15. Since the sale of his interest in the Utica Company Mr. Boyle has not engaged actively in business. Except for the trip abroad he has lived quietly at Whitesboro, near Utica. Mrs. Boyle accompanied Mr. Boyle on the trip abroad.

MR. GEO. M. COLE, who was connected with the Oneonta, Cooperstown & Richfield Springs Railway, of Oneonta, N. Y., before a receiver was appointed for the company, has been selected as manager of the company, to succeed Mr. Chas. H. Tilton. Mr. B. F. Lasher has been retained as general manager of the company. Mr. Lasher formerly was with the Albany & Hudson Railway, operating a third-rail line from Albany to Hudson.

COL. SIR CHARLES EUAN-SMITH, K. C. B., C. S. I., chairman of the board of directors in London of the Mexico Electric Tramways, Ltd., is on a visit to Mr. W. W. Wheatly, president and resident manager in Mexico City, Mex., of the Electric Tramways, and will remain in that city several weeks. Sir Charles, in addition to other things, is chairman of the board in London of the Marconi Company and is on the board of one or more English steam railroads. He came to this side primarily as the representative of the British railways to the International Railway Congress, and took advantage of the opportunity to visit Mexico. Sir Charles is accompanied by Lady Euan-Smith.

LIEUTENANT KIGENJI ICHIKAWA, who was chief engineer in succession of the Odawara Electric Railway, the Keitlin Electric Railway Company, and the Fukagawa Electric Light Company, was one of those who fell in the battle of Mukden. Lieutenant Ichikawa had served with distinction at the seige of Liaoyang, and had proposed to return home, when he decided to accompany the army to Mukden, and take part in the assault on that place. In recognition of the lieutenant's services the Emperor recently awarded him the posthumous degree of Order of the Kite. Mr. Ichikawa was graduated from the electrical department of the College of Engineering, Imperial University, in 1897.

MR. PAUL MORTON, whose appointment by Metropolitan Street Railway interests of New York to a position in which he will have charge of that company's proposed subway work was announced in the STREET RAILWAY JOURNAL of June 3, and referred to at considerable length in the issue of June 10, was on Friday, June 9, elected to the position of chairman of the board of directors of the Equitable Life Assurance Society. His election marks the first step in the reorganization of the society, and was followed by the tender of the resignation of President Alexander and the second, third and fourth vice-presidents. The appointment resulted from the purchase by Mr. Thomas F. Ryan, who is largely interested in the Metropolitan Company, of the stock of Vice-President James H. Hyde, who owned a controlling interest in the Equitable Company.

A NUMBER OF CHANGES of importance are announced in connection with the operation of McKenzie-Mann interests in Canada and elsewhere. Mr. Ewan Mackenzie, superintendent of construction of the Toronto Railway, has resigned to become a railway contractor. His first work of importance will be the construction of the Metropolitan line from Newmarket to Jackson's Point, on Lake Simcoe, north of Toronto. Mr. Alex Smith, brother of Mr. J. M. Smith, comptroller, who has been twenty-one years in the street railway service, also has resigned. He was electrical superintendent, and is succeeded by Mr. J. Donnelly, of Cincinnati. Mr. W. H. Moore, secretary of the Canadian Northern Railway and manager of the York Radial Railway, has resigned from the latter. Mr. James H. Wallace, inspector of the Toronto Railway, has an appointment under Mr. E. H. Keating, resident manager in Monterey, Mex., of Messrs. Mackenzie & Mann.

MR. W. S. WRIGHT, for many years general manager of the Wheeling & Elm Grove Railway, of Wheeling, W. Va., has resigned that position and entered upon the duties of manager of the Jewett Car Company at Newark, Ohio. Mr. Wright will be succeeded in the management of the Wheeling & Elm Grove by Mr. L. S. Kirker, now general manager of the City Railway. Mr. Kirker will thus have two roads under his supervision. Mr. Wright became connected with the street railway lines in Wheeling in 1892, and later became the general manager of the Wheeling Traction Company, resigning that position to accept the general management of the Wheeling & Elm Grove. Some fifty employees of the company, without giving any previous notice of their intentions, made an unceremonious descent on Mr. Wright and his wife at their apartments at Wheeling a few days ago and presented Mrs. Wright with a magnificent cluster of American beauty roses and to Mr. Wright a solid silver gold-lined punch bowl, ladle and tray and the accompanying service of cut glass. The tray bore the fitting inscription: "W. S. Wright, from the Employees of the W. & E. G. R. R., June 5, 1905."

MR. FRANK M. HAINES, second vice-president and general manager of the Northern Texas Traction Company, of Fort Worth, Tex., is dead. Mr. Haines was one of the large stockholders in the company of which he was general manager, and directed the construction work of the interurban line between Fort Worth and Dallas, and also of the extensive improvements and additions made to the company's lines in Fort Worth. Mr. Haines was forty-five years of age and a bachelor. He was born in Pennsylvania and was graduated from the Massachusetts Institute of Technology. In 1884, the year of his graduation, he entered the service of the Northern Pacific Railway Company in its engineering department, remaining in the employ of this company until 1892, during which time he had charge of construction work in Washington, Oregon and Idaho. He was general manager of the Central Coal & Iron Company, of Louisville, Ky., from 1892 to 1894. In 1894 he went with the Johnson Company as chief engineer of construction of its plant in Lorain, Ohio. He built what is known as the Black River Electric Line from Elyria to Lorain, Ohio, a distance of 8 miles, and had charge of the construction of the Cleveland & Lorain line, through Elyria, a distance of 33 miles. Mr. Haines became interested with the Bishop-Sherwin syndicate, the owners of the Northern Texas Traction property, in 1900, and has been prominently identified with them since that time.

MR. NORMAN McD. CRAWFORD has resigned as general manager of the Hartford Street Railway Company, of Hartford, Conn., to become consulting engineer of the Consolidated Railway Company, the holding company for the New York, New Haven & Hartford Railroad, of the Hartford Street Railway and other electric railway properties in New England. Mr. Crawford will continue to live in Hartford and will have his headquarters in the Connecticut Mutual Life Insurance Company Building in that city. Mr. Crawford, who has been general manager of the Hartford Company for the past ten years, came to Hartford about fifteen years ago. Before that time he had been for thirteen years at the car shops of the Pennsylvania road at Altoona, Pa., had been superintendent of the Meriden Railway and had built the Rochester Street Railway. He came to Hartford as contractor for the Hartford & Glastonbury line, which was opened in 1892. His success in that capacity led to his being offered a position with the Hartford Company, and after supervising the construction of its power plant he was appointed to the position from which he has just retired. Mr. Crawford's successor in the Hartford Company is his associate, Mr. Frank Caum, who is known as the acting general manager. Mr. Caum has been superintendent of the company since 1897. Before that he was chief engineer of the company, in which capacity he entered the service of the company. Previous to his connection with the Hartford Company he had assisted in the construction of street railway lines in Jersey City and Rochester. His first commercial experience is said to have been gained at the shops of the Pennsylvania Railroad in Harrisburg.

MR. W. S. HEGER, whose name has been closely associated for years with the Westinghouse interests, has joined the Allis-Chalmers Company, becoming assistant to the vice-president and general manager. Born in 1857 at Fort Simcoe, Washington Territory, then one of the frontier posts of the United States Army, Mr. Heger received his education both in this country and Europe, spending seven years in Vienna, Austria. After receiving the degree of M. E. at Stevens' Institute of Technology, in 1879, Mr. Heger's business career began in the mechanical draughting room of the Edge Moor Iron Works. In 1885 Mr. Heger went into business as a contractor and electrical engineer, and later became sales agent and constructor for the Edison Company for isolated lighting plants in the States of Delaware, Maryland, the Virginias and the Carolinas. In 1889 Mr. Heger was sent to San Francisco as district manager for the Pacific Coast territory for the Edison Company and for the Edison United Manufacturing Company. He built up the organization there which exists to-day under the General Electric Company and established a large and successful business. In 1892 he accepted the place of general manager of the Wilmington City Railway Company, Wilmington, Del., and spent three years there rebuilding and operating the road. Returning to the Pacific Coast again in 1895, Mr. Heger became the district manager for the Westinghouse Electric & Manufacturing Company, with headquarters in San Francisco. He built up a strong selling organization, and made a wide market for the products of his own company and those of the Sawyer-Man Company. During his administration the initial long-distance power transmission plants of the Pacific Coast were built, and in the construction of these many unlooked for features had to be met. The creating of a market for the products of his company in the new fields developed by these long-distance transmission plants formed a valuable part of his experience. Mr. Heger resigned his position with the Westinghouse Company in April. His headquarters are at the general offices of the Allis-Chalmers Company, in Milwaukee.


W. S. HEGER

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NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 8000 *copies are printed. Total circulation for* 1905, *to date,* 205,100 *copies an average of* 8204 *copies per week.*

Calling of Streets

We frequently take occasion in these columns to call the attention of the managers to the need for care in certain details of operation which are almost self-evident, but which, to judge from existing conditions, need correction. These criticisms are intended merely to set managers to thinking as to whether their own service is as perfect as it should be. One of the things which requires the most eternal vigilance is the calling of street names by conductors. The impossibility of understanding the steam railroad brakeman or conductor when he announces stations has become one of the standing American jokes. Probably the only reason we do not hear more complaint about the calling of streets by street railway conductors is that the majority of people who patronize street cars are familiar with the city and do not need to have the streets called for them. Nevertheless, there are always likely to be some passengers not familiar with the city who are subject to much annoyance if streets are not called plainly.

Conductors fall into careless habits as regards calling streets, simply because so many of the passengers know the streets. Again, many of them do not understand the correct principles of enunciation. There is a great difference in men in this respect, but anyone who really wishes to can greatly improve his articulation and the ease with which his announcements are heard. As explained in an interesting article elsewhere in this issue, loudness is not necessary, in fact sometimes defeats the object sought. The principal points to bear in mind are distinctness, the art of enunciating each syllable and the practice of addressing the audience directly instead of shouting the names of stations into the nearest corner of the car. It would not be a bad idea, on those roads where the names of streets and public buildings are announced by the conductors, to any considerable extent, to put the men through an examination on this point, and, if necessary, to make them practice a little on distinct speaking. Steam railroads are paying attention to this matter, with the result that there is a great difference between the way stations are called now and twenty years ago, which goes to show that an improvement can be made on street railways if the matter is only looked after. As a matter of fact, conductors on carelessly managed roads often fail to call streets altogether, or call them carelessly and without any idea of making themselves heard in the car, so that the whole proceeding is almost a farce. If street names cannot be called so that passengers the entire length of the car can hear them, it would be better to strike out the rules requiring the calling of streets entirely and have the conductors call only those specially requested by the passengers.

Rotary Converters vs. Motor Generators

There has been considerable difference of opinion among engineers as to the relative merits of rotary converters and motor generators in sub-stations for converting from alternating to direct current. At the recent convention of the National Electric Light Association at Denver, Mr. Alex. Dow, of Detroit, made a clearer statement of the situation than is often heard, although some may not agree with his conclusions. Mr. Dow took the position that where direct current for electric light and power purposes is to be supplied from a sub-station, a motor generator set equipped with a synchronous motor taking the alternating current at the transmission voltage, is much more satisfactory in operation and cheaper in first cost than would be a rotary converter with step-down transformers and the necessary regulating appliances for doing the same work. If supplying direct current for railway purposes, he considered that step-down transformers with rotary converters would be cheaper and more satisfactory even when the alternating current is supplied at 60 cycles. This is not altogether in accordance with estimates made by other engineers, but includes some necessary items frequently forgotten in such estimates. It is a matter of common knowledge that a step-down transformer with a rotary converter of a given capacity does not cost as much per kilowatt as a direct current generator and a synchronous motor of the same capacity. Mr. Dow argued that, in order to supply the necessarily wide range of voltage for a direct current lighting where the line loss must be accurately compensated for, it would be necessary to equip the rotary converter outfit with induction-regulating apparatus for voltage regulation and safety devices to prevent runaways, which would make the cost of the rotary converter complete installation greater than that of the motor generator. Furthermore, the motor-generator set would not be so susceptible to voltage disturbances as the rotary converter. For supplying current to an interurban road, where accurate voltage regulation is not essential, he thought the rotary converter would be cheaper and sufficiently reliable for the purpose. The 60-cycle rotary converter for railway work has not by any means been looked upon favorably, although a number of such machines are in daily operation. They have been generally considered as rather uncertain pieces of apparatus, likely to go to "pumping" or "hunting" at almost any moment, giving rise to surges of current which may open the circuit breakers and throw them off the line. It is now claimed that the steam turbine has altered the situation materially, and that it is as easy to operate 60-cycle, 500-volt, rotary converters supplied from turbo-alternators, as it is to operate 25-cycle rotary converters when supplied from engine-driven alternators. The difference in performance is, of course, due to the fact that the steam turbine-driven alternator is not subject to the variations in speed during each revolution that is common with engine-driven alternators, even of large fly-wheel velocity.

The Economics of Three-Phase Traction

It is rather singular at this particular time, when so much of interest is centered in the new single-phase railway motors, to find two convention papers at the American Institute joining in strong advocacy of three-phase induction motors for not only heavy railway work, but for that severe suburban class of work which requires peculiarly rapid acceleration. The predilection of many European engineers for this class of apparatus doubtless has its origin in the sentiment voiced by Mr. De Muralt in saying: "The three-phase, alternating-current motor is probably the most robust and thoroughly mechanical piece of electrical machinery extant." Most engineers who are familiar with three-phase working will probably join in this conclusion, but the distrust of multiple trolley wires is so strong in this country as to outweigh many real or supposed advantages. Mr. De Muralt takes up especially the case of adapting electric traction to the miscellaneous work of ordinary railroading, and fortifies his position by a detailed study of the equipment of a particular road investigated recently with electrical haulage in view. The road taken had 224 miles of single track, excluding sidings and including an ore road 49 miles long. It is, on the face of things, a case where the three-phase system, or any other able to carry a high voltage upon the working conductor, should have a considerable advantage in first cost of installation. It is therefore not altogether surprising to find the three-phase system some $900,000 to the good, as against a third-rail system fed by rotary converter stations. It must be noticed, however, that Mr. De Muralt counts on converter stations every 10 miles, which, although this spacing gives at times excessive drop, is rather closer than would generally be expected. Maximum economy on either system would probably call for a different schedule from that assumed, but every change toward this would lower the actual difference in costs, while leaving their rates substantially unchanged.

Even allowing for this difference, the d.c. system is much the more costly, as necessarily results from the low voltage and heavy loss in the working conductors. For the same reason the d.c. system is at a disadvantage in efficiency and general operative economy. Speaking broadly, any system that uses 5000 volts on the working conductors must win out in economy over any system using a few hundred volts, supposing the motors to be anywhere nearly at equality. We wish, however, that with this same road Mr. De Muralt had worked out the equipment with single-phase, commutating motors, and with locomotives equipped on the Ward Leonard system, both of which he discusses briefly, the former with some severity, the latter with qualified approval. However, these two systems require different plans of operation, the former working to advantage with many and short trains, the latter with longer trains, so that a comparison could with difficulty be made fair to both. Mr. De Muralt takes up at some length the objections commonly urged against three-phase traction, and basing his judgment on actual results obtained abroad, is inclined to think them hypercritical. He particularly calls attention to the fact that in relatively slow accleration the three-phase motor requires less current input for the required torque than the corresponding d.c. motor, so that in actual practice an acceleration of 0.5 per mile hour per second is obtained in three-phase motors with current only some 20 to 25 per cent above full-load running current, and he also holds that for higher accelerations favorable results can be attained. As to the overhead work, Mr. De Muralt holds that the somewhat increased line repairs of a double trolley line are more than offset by the relative immunity from motor repairs in case of induction motors, so that, upon the whole, the total repair bill is likely to be lessened. On this point few American engineers will agree with him, but, on the other hand, few American engineers have personal knowledge of three-phase traction, as practiced abroad, and of these few at least a sturdy minority agree with the judgment here indicated. We must confess, however, to a desire for more detailed information as to these multiple trolley wires in everyday use.

Mr. Waterman's paper takes up an entirely different phase of the subject—the application of three-phase motors to fast suburban work where very stiff acceleration is a prime necessity. This is the field generally held to be peculiarly adapted to d.c. motors. Mr. Waterman, however, takes up the very hypothetical case assumed by Mr. Berg in his well-known paper on the subject, and shows the change made in the results by the suitable design and use of the motors. In particular, he shows that with proper choice of the rate of acceleration, leaving the schedule unchanged, the results postulated by Mr. Berg for d.c. motors can be bettered with three-phase motors so as to gain some 12 per cent in cost of equipment and nearly 4 per cent in energy required. It is quite possible that a slight change in the schedule would change these figures, but the intent of Mr. Waterman was to adhere rigidly to Mr. Berg's schedule. We note that Mr. Waterman lays stress on the importance of the ability of three-phase motors to return energy to the line in braking. This is a much-debated matter, and in this country, at least, the gain has been considered of doubtful expediency, certainly in case of motor systems other than three-phase. Some experiments made by Mr. Waterman on the Valtellina line showed that nearly 60 per cent of the total energy expended on a long grade was recovered on the descent, surely an amount worth considering. The grade in this instance was 1.8 per cent, which shows at least a possibility of good results on certain lines. Mr. Waterman also calls attention to the curious result when the generator speed falls slightly on the Valtellina line. The immediate effect is to cause return of energy from all motors initially running near synchronism, so that each train acts as a flywheel to soften the effect of sudden changes of load. The result at the station is stated to be most conspicuous.

Altogether, these two papers are very powerful pieces of special pleading well adapted to arouse renewed interest in three-phase traction at a time when the current of popular opinion was setting in other directions. Current practice here has set itself firmly against any method of traction requiring more than the one working conductor, which is accepted as a necessary evil. This is really the vital point in any such discussion, and we much wish that someone could and would give us a detailed and unbiased account of the working of the overhead system on the Valtellina Railway with a bill of repairs for the last fiscal year.

The Wheel Question

The question of wheels is always with us, and will ever remain one of the problems to confront the prospective manager. Improvements have been made in motive power which have revolutionized nearly every other portion of a road's equipment, but there seems to be no future possibility of dispensing with the use of wheels. The problem before the electric railway manager, therefore, is how to secure the cheapest and most reliable wheel per 1000 miles run. Various articles which we have published on the subject of steel wheels for city and interurban service have elicited the request that we should present, if possible, further records as to the life of steel wheels in electric railway service. Unfortunately, it is extremely difficult to present any reliable data on this important subject. The lives of individual wheels and the records of a comparatively small number of wheels can be quoted under conditions where there might be a choice between the chilled-iron wheel and the steel wheel, but, unfortunately, most of the street railway managers who are using steel wheels have not had them in service long enough to give records which afford much of a criterion of their life in continued service. In any comparison of this kind the cost of turning down the steel tire until its useful thickness is worn out should be taken into consideration as well as the cost of grinding, boring and fitting chilled-iron wheels as they reach the end of their useful life. If we assume, for instance, that a steel tire will stand four to five turnings, and that it will last as long as a certain number of chilled-iron wheels in any particular service, and that the cost of each turning will about equal that of refitting a chilled-iron wheel to the axle, the cost of the tire can be compared directly with that of the cast-iron wheel, although the latter should be credited with the value of scrap. We hope to have records available soon of the entire life of tires and their cost, which will throw considerable light on this interesting branch of electric railway operation.

Electricity on Mountain Railroads

There is undoubtedly a great awakening at the present time as regards the desirability of electric traction on certain portions of our steam railroads. Recent discussions on the subject have brought out the general consensus of opinion that it will be a long time before electric traction replaces steam locomotives entirely, but that there are a number of special applications of electric traction to steam roads which will be made very shortly. The three principal applications that have been suggested are the electrical equipment of tunnels and terminals, the electrical equipment of suburban service, and the electrical equipment of certain portions of steam railroads having heavy grades and located near large water powers. The last application is being considered more seriously than is generally supposed. There are many important water powers in the mountain regions that have not been developed, and, as has been indicated in recent articles in these columns, the expenses of steam haulage on heavy mountain grades are enormous when compared with ton-mile expenses on prairie divisions. There is also the further consideration that summer passenger traffic on these mountain roads is made up largely of tourists and sight-seers. They do not relish the excessive amount of smoke and cinders that always accompanies mountain climbing with a steam locomotive. Some of these mountain roads run open observation cars during the summer season, but much of the pleasure derived from the open car is counteracted by the fact that cinders are falling so thick. The electrical equipment of such roads has many points in its favor, both from a freight and passenger standpoint. The greatest obstacle is the high investment per mile of track which electrical equipment would involve. The traffic is often not very heavy on some of these mountain roads, so that a large investment for electrical equipment per mile of track would involve heavy fixed charges per ton mile haul. There might be some possibility on such roads of cutting down the kilowatt hour operating expenses by using a form of motor which will return energy to the line on down grades. The last analysis, however, shows that such a feature would be mainly valuable in whatever effect it might have in reducing the investment necessary to operate a certain road. It is mainly the maximum load that determines the fixed charges. On mountain rack railways, which are more numerous in Europe than in this country, there is hardly any excuse at the present time for the use of steam. On such a road, for example, as that operating up Pike's Peak in Colorado, the steam locomotive can only be regarded by the electric railway man as an unmitigated nuisance. The locomotive being placed on the down grade end of the train, passengers are favored with an almost uninterrupted volley of cinders from one end of the trip to the other. There is usually a strong current of air up the canons which the road traverses, and this carries the smoke and cinders up just fast enough to deposit them on the passengers. The use of an open car, which would be highly desirable, is out of the question. Furthermore, owing to the reciprocating action of the locomotive on the various steep grades, the car is pushed up by a series of impulses or jerks which are very unpleasant. With water power as cheap as it is in these mountain regions, there should be little excuse for the operation by steam of such roads. The present high operating expenses necessitate high fares, which in turn act to keep the traffic down. It is safe to say that traffic is nowhere near what it would be with the lower rates of fare made possible by electric traction.

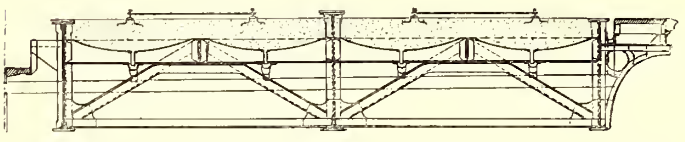
ELEVATED CONSTRUCTION IN PARIS AND BERLIN

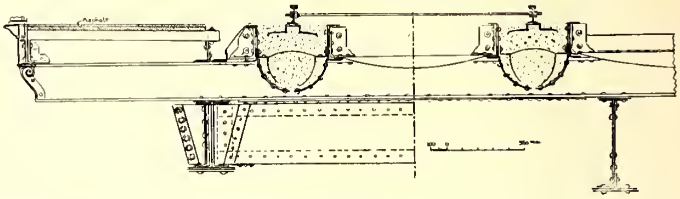
BY JOHN P. FOX

Mr. Arnold's report on reducing noise on the elevated loop in Chicago opens up a very interesting future for new elevated lines, especially if reinforced concrete can be used in place of steel, bringing a complete elimination of noise from structural vibration-parapets shutting in much of the noise from the rolling stock. The report came at a timely moment, when several localities were bitterly opposing further elevated construction. One of the great advantages of a concrete viaduct would be its light color, harmonizing well with abutting buildings, and making up for any darkening effect of a solid floor. Iron rust and oil from the cars would not get all over the structure as now if parapets were used, but it would be an added improvement if a ballasted roadbed were kept as clean as in Berlin and Paris, where the gravel is as fresh as on a beach.

While subways may be best for the centers of very large cities, elevated lines have a very important use, perhaps no more temporary than subways, and the writer expects to show in a future article how such lines may effect radical changes and improvements in existing city systems. It has been found by Mr. Arnold and others not only that noise can be practically eliminated, both on existing roads and on new ones, but also that the most critical of architects can be satisfied as to æsthetic appearance with little or no additional expense.

It appears now that the noise question was practically settled in Berlin about twenty-five years ago by the experiments undertaken to determine the best construction for the steam elevated line or Stadtbahn through the center of the city. While much of this road consists of arched masonry viaduct, there were 65 bridges and spans on which it was desired to have a flooring both noiseless and watertight. After many experiments and observations, it was found that ballast on a solid flooring was entirely satisfactory, and so it was adopted throughout. Some of the results of the experiments are interesting. While noise was found to vary with the length of an iron bridge, no material difference could be noticed between plate and latticed girders, disproving the theory that plate webs were transmitters of noise. Where the rails rested directly on the iron structure of a bridge, there was of course more noise than where the rails rested on wooden stringers. In regard to stringers, it was thought that they reduced the noise no more than cross-ties, but it was found recently on the Berlin electric elevated railway that a deep stringer was quite effective in reducing noise. (See STREET RAILWAY JOURNAL, June 4, 1904, page 842). Layers of felt or rubber between the structure and cross-ties reduced noise somewhat, but a solid wooden floor had no apparent effect. Covering the tracks with a thin layer of gravel had a very material effect, but the most effective remedy for noise was a regular ballasted roadbed. It was found also that the quality and condition of the steam rolling stock exerted a great and remarkable influence on the quantity of sound.

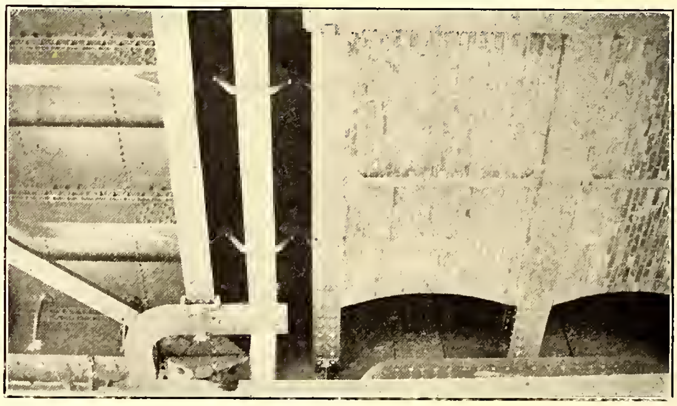




TWO FORMS OF THE BALLASTED FLOORING USED ON THE BERLIN STADTBAHN

The two forms of ballasted construction adopted on the Berlin Stadtbahn are very interesting, although, after twenty-five years, improvement can naturally be suggested. The rails throughout were carried by metal stringers of most compact design, the gage being maintained by tie rods. The ballast under these stringers was sometimes carried in parallel metal troughs, one under each rail. The intervening space was filled with thin buckle plates to hold all water and was covered with gravel to reduce vibration. Elsewhere the entire floor was ballasted on buckle plates, which were everywhere drained into gutters and sewers. To keep the ballast from sliding over the floor plates, the latter were tarred and then covered with sand. This roughness was found to be enough to hold the gravel in place without affecting drainage.

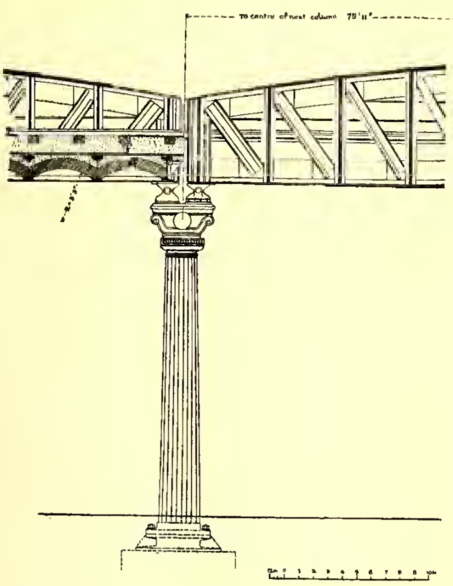
STANDARD VIADUCT DURING ERECTION, PARIS METROPOLITAN RAILWAY

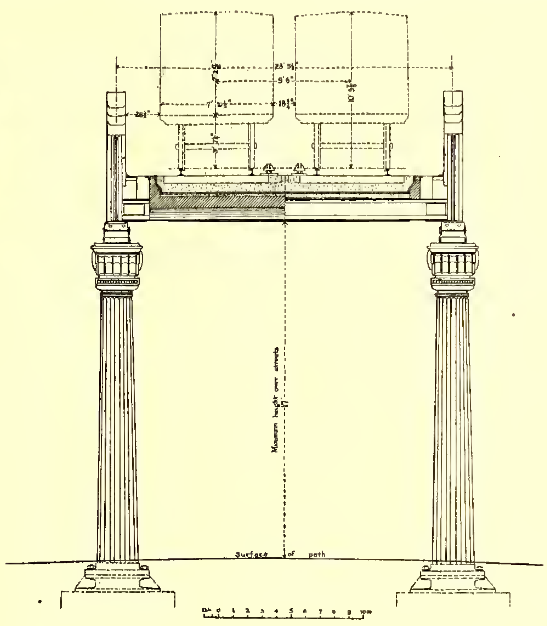


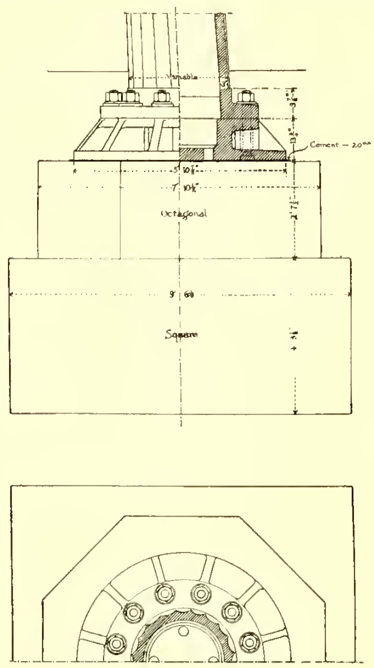
UNDER SIDE OF STEEL-FLOORED BRIDGE TO LEFT, STANDARD BRICK-ARCHED FLOOR TO RIGHT, PARIS

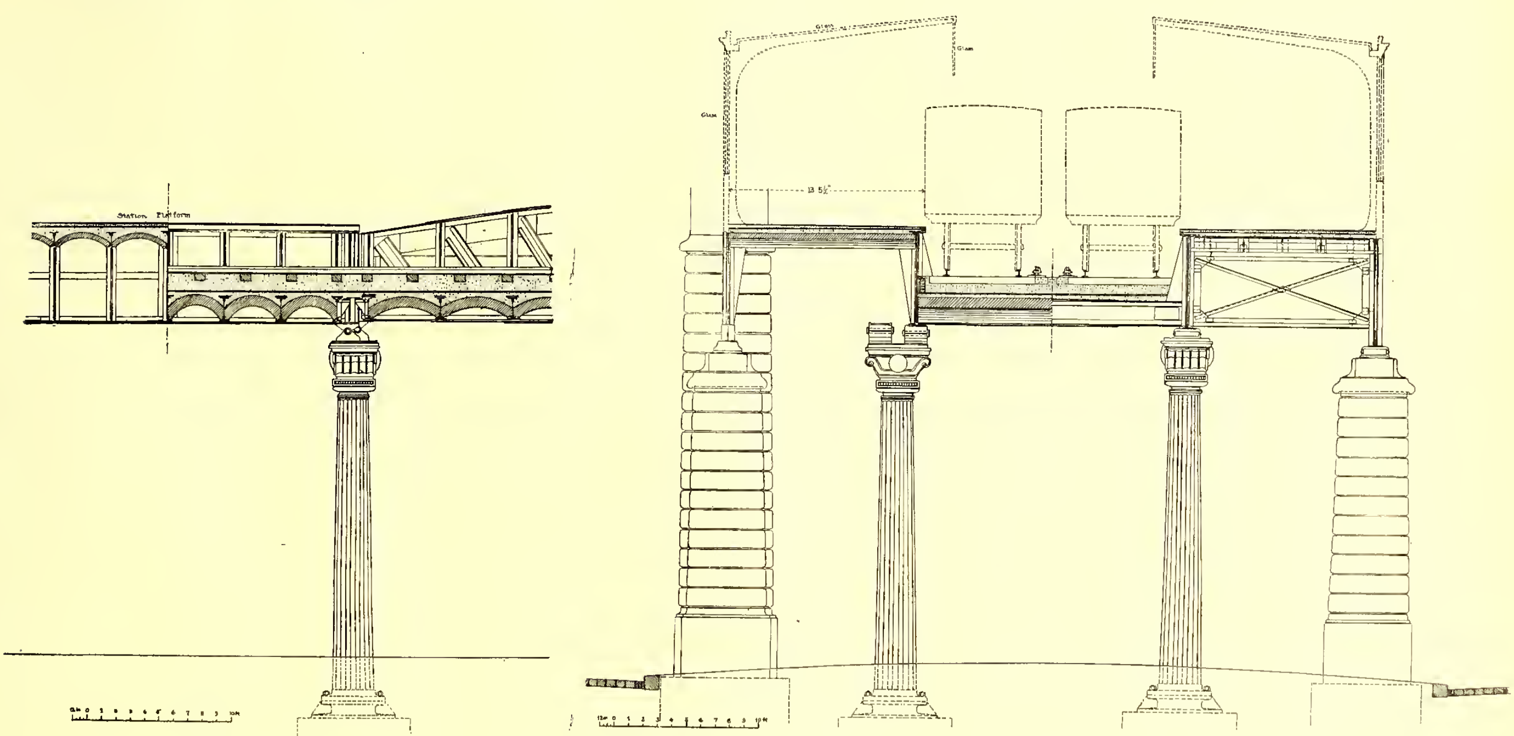
The elevated division of the Paris Metropolitan Railway presents another example of the effectiveness of a solid ballasted floor in reducing noise. While most of the Paris lines will be underground, it was thought best to construct something like 5 miles above ground, chiefly for topographical reasons, as for convenience in crossing a deep valley and the Seine twice, and two railroads. In addition to these reasons, when the Metropolitan system was being planned, there was a strong expression of opinion in certain quarters that the Parisians would not like to ride underground. This opinion may have had a certain influence in keeping portions of the lines up in the open air, although, as soon as the first underground line was put in operation, its immediate popularity dispelled all previous fears. While the elevated lines in Paris, with their heavy ballasted floors along broad boulevards, are very quiet compared with American elevated roads, still there has been strong criticism because underground construction was not adopted, at least on the northern side of the city. The principal objections raised have been the unæsthetic appearance of an elevated structure, the fear of serious noise and vibration which, however, have not materialized, the injury to the boulevards as a place of promenade, and the greater cost over a subway. Where the viaduct follows closely the changing profile of the boulevards, it has been compared to a roller coaster, and criticised for presenting such an unpleasant appearance. But while some may find fault with the construction for being too heavy, any heaviness is a great advantage in reducing vibration and noise. Great care has been taken to make the columns, piers, stations, fences, etc., artistic, and the station façades are especially attractive.

As to methods of construction, the foundation stones rest on concrete or piles, or deep concrete piers. Longitudinal thrusts are taken up by the frequent masonry piers, between which are cast iron columns, which are not anchored in any way to the foundation stones, but depend for their stability on their broad base, nearly 6 ft. in diameter. On the capitals of the columns, resting alternately on fixed and roller bearings, are the latticed girders of varying spans, carrying transverse girders, between which are turned brick arches, on which in turn is placed the ballast of river gravel. The whole floor is carefully drained into gutters and conductors. The minimum headroom between the girders and the street surface at crossings is about 17 ft., which allows an 8-in. clearance above the highest point of any double-deck car. The heaviest estimated weight on one track of a short span would be that of two double-truck motor cars,


LONGITUDINAL SECTION AND ELEVATION OF VIADUCT


CROSS SECTION OF VIADUCT, PARIS


CAST IRON COLUMN AND FOUNDATION


LONGITUDINAL SECTION OF STRUCTURE—CROSS SECTION OF ELEVATED RAILWAY STATION IN PARIS

each weighing about 70,548 lbs. The Berlin electric elevated road was designed for loaded cars weighing about 57,320 lbs.

In crossing over the Est and Nord Railways, spans of 247 ft. were thought too long for a ballasted floor, so the cross ties rest directly on flat plate floors, which vibrate very loudly with the passage of trains. But the resulting noise is not serious because of the steam lines already existing beneath, and the steel floored bridges afford very striking examples of the effect of ballast on noise, for, when the thundering trains leave the bridges for the ballasted roadbeds on each side, the rattle dies down to a surprising degree.

The stations are of fireproof construction throughout, with two side platforms roofed over their entire length. These platforms are 247 ft. 6½ ins. long and 13 ft. 5½ ins. wide, are situated 33½ ins. above the rails and are at a minimum height of 20 ft. 6½ ins. above the street. The station walls, roofs, and canopies are all glazed, making them very light. As the trains on any track of the Metropolitan run to only one point, it is unnecessary to have destination signs on the trains themselves, these being placed at the entrances to the platforms, and on the platforms besides are signs telling the destination of the trains on each track, as "Direction de Dauphine" on one side and "Direction de la Nation" on the other. At the terminals are further signs showing where to transfer for different connecting lines. The Paris operating system in this respect, by avoiding all junctions, simplifies conditions at way stations, but may tend to increase congestion at transfer points.

RAISING A CAST IRON COLUMN

VIADUCT ON A BOULEVARD

STEEL WORK ON UNDER SIDE OF VIADUCT

Some account was given in the STREET RAILWAY JOURNAL for Dec. 31, 1904, of such features of the Paris elevated lines as the cars, bridging the Seine, and the general cost of construction. The new cars on the northern lines are especially roomy and comfortable. They have an abundance of plated posts and rods to take hold of, and which rest on the backs of the seats; convenient baggage racks are overhead; the ventilating transoms are easily accessible; the aisles are very wide, and the cars are furnished with compact seats facing each other. With the two double doors for 25 seats, passengers can be handled very quickly.

The steepest gradients occur on the inclines between the elevated and underground lines, there being two of 4 per cent, on the northern line (Line No. 2, North). The minimum radius is 246 ft. The unusually substantial construction of viaduct and stations made the cost far higher than with underground work. Whereas the underground sections of Line No. 2, North, cost from $392,640 to $534,400 per mile, the elevated sections cost at the rate of $819,200, $926,400, and $1,135,680 per mile—the last being the section with three long, steel-floored bridges.

NEW ARRANGEMENT OF TIME-TABLE ON THE CINCINNATI, DAYTON & TOLEDO TRACTION COMPANY

The Cincinnati, Dayton & Toledo Traction Company, in issuing its new time-tables for this season, has adopted a somewhat novel arrangement. All the schedules for the system are contained in one book, 13¾ ins. long x 9½ ins. high, bound with flexible paper covers. The first page of the book contains the time-tables for all United States mail cars on the several divisions. On the second page is a list of the surgeons in the different towns who are retained by the company to attend cases in the event of accident on the road. The list gives the name, address and telephone call of the surgeon at each place, and also of an alternate, and train crews are instructed to call the nearest company surgeon or the alternate when a doctor's services are required.

The next three pages contain general rules for the guidance of train crews with reference to signals and the movement of trains. These rules are unusually complete, and in view of the interest in rules for securing greater safety precautions on interurban roads, the following abstract is made of those pertaining to the movement of trains:

BLOCK SIGNALS TO BE USED BY MOTORMEN AND CONDUCTORS

42. Signal lights must be used in running between all switches where the same are provided, unless otherwise ordered by the despatcher. If for any reason the signal lights are not working, you must not proceed without orders from the despatcher to do so, excepting as follows:

A. Regular Trains.—If for any reason you cannot get the despatcher by 'phone, you will proceed on regular schedule, passing regular trains at schedule passing points, and notify the despatcher of the trouble as soon as possible.

B. Extra Trains.—If for any reason the signal lights are not working and you cannot get the despatcher, you must wait for the next regular train, and run as second section to the regular train, until you can get orders from the despatcher.

C. Work trains will be permitted to work between switches without signal lights only on orders from the despatcher.

D. Work trains, when working between switches near a curve or any place where your car cannot be clearly seen for a distance of 1000 ft., 10 poles each way, the conductor of the work train must go at least 10 poles in the direction from which the next car is due and flag the approaching train.

SIGNALS TO BE USED BY TRACK, BRIDGE AND LINEMEN

43. The following rules and signals must be used and observed by trackmen, bridgemen and linemen for the protection of all, whenever work is being done upon track, bridge or line.

Two sets of signals shall be used. One to indicate danger; the other to indicate caution. The signal shall in every case be displayed 1000 ft. (10 poles) on either side of the point at which the workmen are engaged.

A. A red flag by day and a red and white light together, or either one alone placed between the rails, at night will indicate danger, and all trains must be brought to a complete stop when these signals are displayed. A train brought to a stop by those signals will not proceed until the signals have been removed by some authorized person.

B. A red flag by day and a red and white light, or either one alone by night placed at the right side of the track, will indicate caution, and whenever those signals are displayed all trains must immediately be brought under perfect control and proceed cautiously, expecting to be stopped at any time, until they have passed a similar signal.

CLASSIFICATION OF TRAINS

44. All trains are designated either as regular or extra. All regular trains are scheduled on time-table, and one or more cars carrying a marker will be considered a train or section of a train. Each section of a train, except the last, must carry the proper signals to indicate that a train is following.

45. Extra trains are not shown on time-table, and they have no rights except those given them by the train despatcher.

MOVEMENTS OF TRAINS

46. All scheduled trains have equal rights to scheduled meeting points, and all sections of trains have equal rights, unless otherwise provided by order.

47. No train will leave a station or siding before the time set for it, or without a signal from the conductor.

48. Extra trains must not be run without orders from the despatcher.

49. Extra trains must clear the time of scheduled trains by two minutes except at meeting points made by order.

50. All trains will report to train despatcher before leaving terminal stations, also at meeting points if opposing train is not there.

51. (A) Crews on trains unable to make schedule time must report to despatcher at once.

(B) Crews on trains running late and passing on sidings other than regular schedule passing sidings must report to despatcher where passing opposing trains unless otherwise ordered.

52. All trains must come to a full stop before crossing any steam railroad tracks, and conductor must go ahead and look up and down steam railroad tracks to see that no steam train is approaching before he signals his train across. Motorman must not start his train until he receives a signal from the conductor.

53. All trains must stop before crossing a switch at the intersection of two or more of this company's lines, or at the intersection of the lines of this company with those of another electric railway, and the motorman must not start his train until he receives a signal from the conductor to do so.

54. The first train reaching meeting siding must take siding for opposing train.

55. All trains will approach meeting points under perfect control, and must not attempt to pass until signals and switches are seen to be right and train taking siding is known to be into clear.

56. Conductors and motormen will be held equally responsible for adjustment of switches used by them

57. The headlight must not be cut out or concealed when taking siding to meet another train until after the train clears the main track or when standing to clear at the end of double track or at a junction point.

Headlight must be exposed at all time when not clear of main track.

58. (A) All interurban trains must report to despatcher at terminal stations and sidings Nos. 30 and 61.

(B) All trains entering on or leaving branch lines must report to despatcher at junction.

(C) Where a layover is had the crew must report when arriving and before leaving unless otherwise ordered.

59. No excuse of any kind will be accepted for passing switches ahead of time.

60. Train must not be run backward for any great distance without turning trolley.

EXTRA TRAINS

61. All trains not represented on the time-card are termed "Extra," and must carry a white signal.

62. When regular trains are running late, under no circumstances must extra trains proceed into a block until notified to do so by the despatcher.

63. Should an extra train meet a regular train on regular schedule passing siding, extra must release block in rear, and both regular and extra crews call the despatcher for orders.

64. Should extra train come to a siding where it should pass a regular train, and the regular is not blocked in, extra crew must release block in rear and call up despatcher for orders. If you cannot get the despatcher by 'phone, lie there until regular comes up going in same direction, and run as second section to destination.

65. If for any reason a train may be lying on the siding and not using the signal lights, the crew must watch signals very closely and notify crews on trains passing that siding, if signal light is against them.

Both motorman and conductor on waiting train will be held equally responsible for the observance of this order.

WORK TRAINS

66. Work trains have no right on main line, except those given by the despatcher, and must clear the time of all regular trains.

TRAIN ORDERS

67. Special orders directing movements varying from or in addition to the time-table will be issued by the authority and over the signature of the train despatcher.

68. To obtain orders, conductors of trains will call the despatcher, who will give such orders as are necessary.

The conductor will repeat his orders to his motorman as soon as received and before leaving siding.

69. Each train order must be written by the conductor as received by the motorman on the form provided, and not from memory or memorandum. When the writing is finished, the motorman will repeat the order to the despatcher, who will say "complete," if found correct, giving the time and the initials of his name, after which the order is effective. If the wires should fail before "complete" is received, a train order is non-effective or of no force.

70. After receiving an order, the motorman will repeat it to the conductor, who will acknowledge receipt of the order by signing his name on the face or the order. Orders must be signed by both motorman and conductor before the train leaves the siding.

71. Train orders must be brief but plain, and on the prescribed form, whenever applicable.

72. All orders used by motormen and conductors must be sent by them daily to the division superintendent.

73. A train of whatever class must be governed strictly by the terms of the order addressed to it, and must not assume rights not conferred by such order.

TRAIN NUMBER			1	3	5		37	39	41		Express 99	101	TRAIN NUMBER.	
STATIONS.	SIDING NO.	MILEAGE.	Note. A.M.	D. A.M.	D. A.M.		D. A.M.	D. A.M.	D. A.M.		D.ex.S. A.M.	D. A.M.	SIDING NO.	STATIONS.
Cincinnati	6	.0	.....	.....	.....	..	20	8 50	9 2		12 00	12 20	6	Cincinnati
Big Fill	8	1.8	.....	.....	.....	.....	28	8.58	9.2		.....	.....	8	Big Fill
C. & N. W. Junc.	10	3.0	.....	.....	.....	.....	5	9 05	9 35	10	2 12	.....	10	C. & N. W. Junc.
College Hill	11	3.44	.....	.....	.....	.....		9 07	9 47	10	...	12 33	11	College Hill
Mt. Healthy	13	5.4	....	.....	.....	....		9.13	9.43	10 1	7	12 40	13	Mt. Healthy
N. Burlington	20	7.4	.....	.....	.....	.....		20	9 50	10 20		12 45	20	N. Burlington

SECTION OF THE SCHEDULE ON THE MAIN LINE OF THE CINCINNATI, DAYTON & TOLEDO TRACTION COMPANY

74. Orders once in effect continue so until fulfilled, superseded or annulled.

75. The following form of train orders will be used in movement of trains on the road. Train despatcher may differ from these forms as the case may require:

Nov. 1, 1903.

Order No. 10.

To Motorman and Conductor.

Train No. 35, Motor No. 22, at Siding No. 32.

Miles per Hr.	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Time Go one mile	12'00."	10'00."	8'43.3"	7'30."	6'40."	6'00."	5'27.3"	5'00."	4'36.9"	4'17.1"	4'00."	3'45."	3'31.8"	3'20."	3'06.5"
Miles per Hr.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Time Go one mile	3'00.	2'51.4"	2'43.6"	2'36.5"	2'30."	2'24."	2'18.5"	2'13.3"	2'08.6"	2'04.1"	2'00."	1'56.1"	1'52.5"	1'49.1"	1'45.9"
Miles per Hr.	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Time Go one mile	1'42.8"	1'40."	1'37.3"	1'34.7"	1'32.3"	1'30."	1'27.8"	1'25.7"	1'23.8"	1'21.8"	1'20."	1'18.2"	1'16.6"	1'15."	1'13.5
Miles per Hr.	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
Time Go one mile	1'12."	1'10.6"	1'09.2"	1'07.9"	1'06.7"	1'05.5"	1'04.3"	1'03.2"	1'02.1"	1'01."	1'00."	59."	58."	57."	56."

TABLE SHOWING THE TIME NEEDED TO RUN 1 MILE AT SPEEDS FROM 5 MILES TO 64 MILES AN HOUR

Meet Train No. 38, Motor No. 21 at Siding No. 35.

And run schedule.

Complete 7:53 p. m. Despatcher.

This is called a meet order; this order gives train No. 35 the right to proceed to siding No. 35, and after meeting train No. 38, they may proceed to their next scheduled meeting point.

Nov. 1, 1903.

Order No. 11.

To Motorman and Conductor.

Train No. 35, Motor No. 22, at Siding No. 32.

Proceed against all other trains to Siding No. 35, and report.

Complete 7:54 p. m. Despatcher.

This order gives train addressed the right to proceed from siding No. 32 to siding No. 35. They must not leave siding No. 35 without reporting to and getting an order from the train despatcher.

Nov. 1, 1903.

Order No. 12.

To Conductor and Motorman.

Train No...., Motor No. 23, at Siding No. 44.

Run as first section Train No. 34, Siding No. 68, to Dayton.

Complete 6:25 p. m. Despatcher.

A train receiving an order to run as first section of any train will display green signals between the points named in the order without further orders from the despatcher. A train receiving an order to run as a section other than the first section will not display green signals unless so specified in the order.

Nov. 1, 1903.

Order No. 13.

To Conductor and Motorman.

Train No...., Extra Motor No. 100, at Siding No. 66.

Report at Siding No. 70.

Complete at 3:45 p. m. Despatcher.

An order to report at a siding or a station does not give any rights to the train addressed. It merely means that they are to report at that point when they get there, and they must not, under any circumstances, leave the siding designated in the order without reporting to the despatcher.

Nov. 1, 1903.

Order No. 14.

To Conductor and Motorman.

Train No. 12, Motor No. 23, at Siding No. 36.

Train No. 13 is annulled between Hamilton and Cincinnati.

Complete at 10:10 a. m. Despatcher.

A train receiving an order that a train is annulled between any two points will run as though the train annulled did not exist on the schedule between the points mentioned in the order. If order merely states that a certain train is annulled, but does not say between what points train is annulled, you will run the same as if said train did not exist on the schedule. Any section of a train may be annulled between any two points.

Nov. 1, 1903.

Order No. 15.

To Conductor and Motorman.

Train No. 1st 34, Motor 24, at Siding No...., Middletown.

Take down signals at Middletown.

Complete 7 p. m. Despatcher.

Train addressed will take down their signals at points designited in order and run as Train No. 34.

Nov. 1, 1903.

Order No. 16.

Train No...., Motor No. 15, at Siding No. 44.

To Conductor and Motorman.

Run extra Siding No. 44 to Trenton, work extra between Trenton and Siding No. 20, from 6 a. m. to 8 p. m.

Complete 5 a. m. Despatcher.

This order gives extra No. 15 the right to leave siding No. 44 upon the completion of the order, provided he clears regular trains according to schedule. He has no right to leave Trenton until after 6 a. m. After 6 a. m. he has a right to work any place between Trenton and siding No. 20, keeping clear of all regular trains.

The next five pages are devoted to the schedule tables, which are printed in large, clear type. A section of the schedule for the main line is shown on page 1094.

The following explanation of the time-table is given:

17. The time-table is the general law governing the arriving and leaving time of all scheduled trains at all scheduled sidings or stations.

18. Where only one time is shown on time-table this will be understood to be the leaving time. Where two times are shown at one place, the earlier time will be the arriving time and the later time the leaving time. Regular trains are designated by numbers at the head of the time schedule.

19. Regular meeting points are indicated on the time-table by figures of full-faced type with black background.

Trains in either direction of the same class have no superior rights over trains in opposite direction, but will meet trains as per time-table, unless otherwise ordered by the despatcher.

On the last page of the time-table book is given for the information of employees a table showing the time necessary to go 1 mile at various speeds from 5 m.p.h. to 64 m.p.h. This table is reproduced herewith. In conjunction with this and the distances in fractions of a mile which are given on the time schedules, the train crew can readily determine how long it will take them to reach any designated siding or station.

PROPOSED SCHEME FOR THE PARTIAL ELECTRIFICATION OF THE MAURITIUS GOVERNMENT RAILWAYS

The report has just come to hand of G. McAlpin, Government electrical adviser, regarding the partial electrification of the Mauritius Government Railways. The plan is gradually to electrify the entire system, but for the present plans are made only for the conversion of that portion of the line between St. Louis and Forest Side, a distance of 16½ miles. The third-rail system will be adopted. A main power station will probably be erected at Port Louis, the terminus of the line, and there will be sub-stations at Beau Bossin and Phoenix, and battery stations at Coromandel and Near Curepipe. The cars will be equipped with the multiple-unit system of control. Each train will be made up of two cars equipped with four 50-hp motors. Electric locomotives will be used for hauling freight. To avoid complications in terminal yards it is proposed to install the overhead trolley. The report is very elaborate, going into details of cost of the equipment.

ELECTRICAL FEATURES OF BLOCK SIGNALING

In a paper on this subject, read at the convention this week of the American Institute of Electrical Engineers, L. A. Thullen described some of the latest features of railroad block signaling, in which he said electricity is now the principal element.

The problem on electric railways differs from that on steam railways inasmuch as in the latter the track can be divided into insulated sections. In the Boston Elevated installation one rail was made continuous for the return and the other sub-divided into sections. On the North Shore Railroad in California, and in the New York Subway, alternating current is used to operate the signals.

In the systems just described, only a small current traverses the sectional rail. Means more recently devised, whereby both

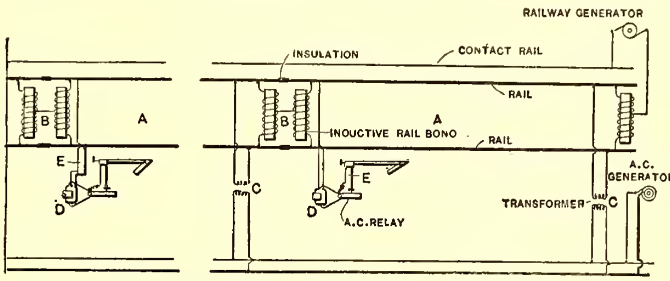


FIG. 1.—DIAGRAM OF WIRING FOR RETURN CURRENT, UTILIZING BOTH RAILS

rails can be utilized to a greater extent for the return current, are shown by Fig. 1, in which *A-A* are block-sections, from 2000 ft. to 4000 ft., in length, *B-B* are inductive rail-bonds of a few turns of copper conductor of about 1,000,000 cm. cross-section. *C-C* are transformers supplying current to the track, and *D-D* are relays operated by alternating current only, controlling the signals through the local circuit *E*. They are similar to those used in the New York Subway.

The transformer is designed to have a large amount of magnetic leakage when the secondary is short circuited by a train in the block, thereby reducing the electromotive force of the secondary and the energy absorbed at that time.

The inductive rail-bond is shown in detail in Fig. 2. The bond is composed of a few turns of bar copper, and adds but small resistance to the track section; in fact, the actual increase of resistance in a track section 3000 ft. long, due to the addition

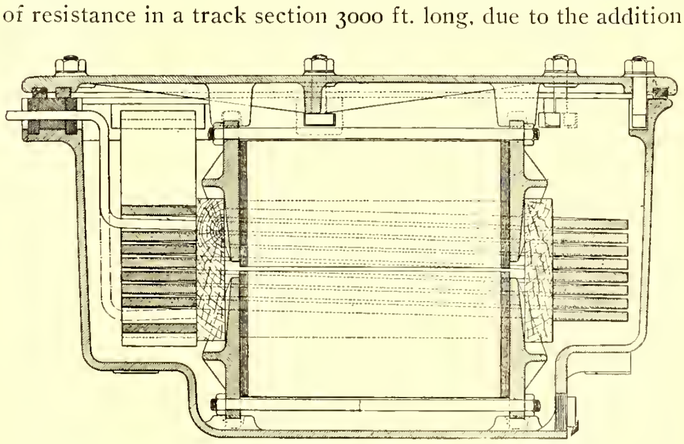


FIG. 2.—DETAIL OF INDUCTIVE RAIL-BOND

of these bonds, is only one-half of 1 per cent; or in other words, the efficiency of the track return is 99.5 per cent.

As shown in Fig. 1 the propulsion current traversing each rail divides and traverses the bond in opposite directions, thereby neutralizing the magnetic action of the direct current; while the alternating current traverses the bond in only one direction, making the bond inductive to the track current.

The question naturally arises: will the resistance of both rails be equal? It is not assumed that they will be, and this is taken care of by making the iron core of the inductive rail-bonds with an open magnetic circuit, the opening being made so large that no excessive unbalancing of the current between the rails will change the inductive effect of the bond.

A relay similar to that employed on the North Shore and New York Subway systems is used in this system, the only changes being of minor importance. The electromotive force at the relay is a little more than 1 volt. In blocks 3000 ft. long there is a pressure of about 6 volts at the transformer, the difference being due to the high impedance of the rail with the alternating current.

The relay is placed at the entrance end of a block and the transformer at the exit end. With no train in a block, the energy absorbed by each block is approximately 50 watts. When a train enters the block at the relay end, the energy is seldom more than 75 watts, and about 300 watts when the train is exactly opposite the transformer. As the train is exactly opposite the transformer but a few seconds at a time, the average actual energy consumed is quite small.

LIGHT SIGNALS

In the East Boston Tunnel light signals only are used, as shown in Fig. 3. The signals have two colored lenses, red for danger and green for safety. The signals are lighted by two

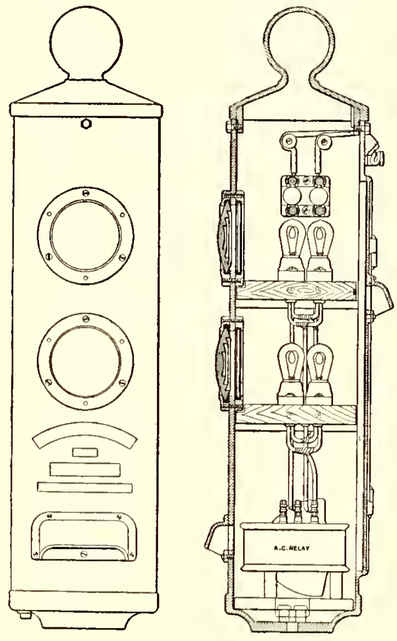


FIG. 3.—LIGHT SIGNALS USED IN EAST BOSTON TUNNEL, CONSISTING OF 4-CP, 50-VOLT LAMPS IN MULTIPLE

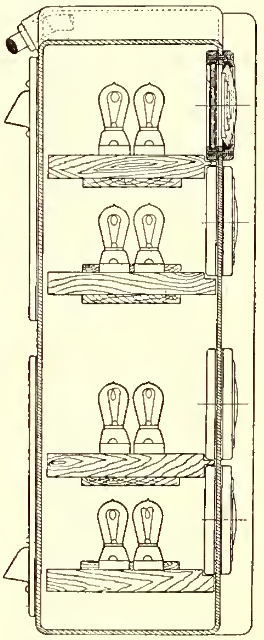


FIG. 4.—LIGHT SIGNALS FOR ELECTRIFIED SUBWAY DIVISION OF LONG ISLAND RAILROAD

4-cp 50-volt lamps connected in multiple. The lamps are placed close together, and in line with the lens, the focus of the lens being midway between the two lamps. Very little difference in the action of the lenses is noticed by this arrangement. Low-efficiency lamps with a coiled filament are used; on account of their low pressure and low efficiency these lamps have long life. Being connected in multiple, both would have to be out at once before the signal would be out of commission; even then there would be no danger, as no light in a signal is considered a danger signal. The current for the lights is furnished from a separate winding on the transformer.

Electrically-lighted signals are fast displacing the oil-lighted ones. They were adopted on the New York Subway after very careful consideration, and their continued satisfactory working has more than justified their adoption. In an installation of this kind men are not required to fill and clean lamps. This means great saving in the cost of labor, and perhaps of life; for in a place like the Subway, where space is limited and the trains are constantly running, it is of very great importance that the maintenance crew be kept as small as possible.

In the East Boston Tunnel the lamps are lighted and extinguished back of the different lenses by means of front and back contacts on the track relays, the contacts being made between platinum and carbon, as no two metals could be used on account of the liability of fusing by arcing or lightning.

At this point it may be said that the layman usually believes that the rails of a track are less likely than any other part of the signal system to be struck by lightning, or to carry currents induced by lightning. Yet this is one point signal men have to contend against. The inductive discharge between rails is considerable, and numerous relays have been burned out or injured by lightning, notwithstanding they were built in the best possible manner, and all parts tested by an alternating current of 5000 volts as an insulation breakdown test.

LONG ISLAND RAILROAD SIGNALING SYSTEM

In the electrified subway portion of the Long Island Railroad electrically-lighted signals only are to be used. The signals are shown in Fig. 4 Four lights will be used: the two upper ones being the signals for the adjacent block, and the two lower ones for the second block in advance. The upper lens is red, danger; the one below, green, or safety; the upper one of the two lower lenses is yellow, or caution, and the lower one green, or safety.

On the elevated and surface portions of this road it is planned to use signals of the two-arm type operated by electric motors from storage batteries of six cells each, the batteries being charged by current taken from the third rail through a suitable resistance. About 250 of these signals are to be installed. Current at 2000 volts and 25 cycles will be furnished the signaling system by mains extending the length of the track.

FREIGHT TRAFFIC ON ELECTRIC INTERURBANS

H. H. Polk, president of the Interurban Railway Company of this city, read an interesting paper before the Iowa Railway Club at its monthly meeting in this city June 12, on the subject of "Freight Traffic of Interurban Roads." Mr. Polk showed the possibilities for freight business along interurban lines were but little appreciated and developed. He quoted figures from the 1900 census showing that 91 per cent of the total earnings of all interurban roads in the United States were derived from passenger traffic, only 5.6 per cent from freight and express, and the remaining per cent from electric light and power service along the line. He compared this showing with the earnings of steam roads, stating that 70 per cent of the gross earnings of steam lines was derived from freight traffic and 30 per cent from passenger business. While he did not maintain that the same relative proportion between the two classes of business would ever be reached by the interurban roads, yet he pointed out the possibilities of the freight business for interurbans which would greatly increase that department of traffic if they would only be developed. Mr. Polk took the position that in order to develop properly this phase of the interurban business, it should be the policy of all interurban companies to put in side tracks, stock yards and loading chutes wherever it is shown they will be used. A shipper does not then have to drive his stock several miles to reach a stockyard and saves the resulting shrinkage and has his choice of the steam roads over which to ship his stock to the large terminal cities, thus enabling him to obtain the lowest rate and the shortest route. Interurbans afford an easy access to a market for sufficient of the garden truck of the farmers to more than pay the taxes, while a considerable portion of this garden truck is now allowed to go to waste.

HINTS TO CONDUCTORS ON THE USE OF THE VOICE

In a recent interview with a representative of the STREET RAILWAY JOURNAL, Prof. S. S. Curry, head of the Boston School of Expression and a well-known expert on the subject of voice culture, gave a number of valuable suggestions on the instructing of conductors with respect to the use of the voice when announcing the names of streets. Prof. Curry emphasized the point that the conductor, when calling streets, should be trained always to speak directly to somebody. He should not speak vaguely or indefinitely into the air, and it is a good rule never to announce anything in the sense of shouting out without regard to the persons for whom the information is intended. The conductor should make it a rule simply to step forward so his head is within the car and tell the passengers in a natural voice where they are. The voice is unconsciously directed by the mind, modulated and colored by the attitude toward others, and by the person, or persons, to whom the words are spoken. The habit of merely roaring out or "announcing" streets is very bad in itself, and leads to a long train of evils. The conductor should open the door and advance his head sufficiently so that his voice will pass into and fill the car.

Conductors often speak indistinctly and run the syllables of words together because the calling of the streets is perfunctory, and only now and then is the interest of the conductor awakened. It should also be remembered that loudness or strength of voice is not what enables people to comprehend what is said. A speaker is understood on account of the naturalness and richness of the tone; on account of its supports—that is, the amount of breath he has in his lungs, and on account of the distinctness of the articulation. By distinctness must not be understood constricted or labored articulation, but simply that each element is unmixed with other elements. There are several things that enable persons to be heard at a distance, but mere loudness is the least of them.

The greatest trouble is with the vowels, especially with the unaccented vowels. In the word Massachusetts, for example, rarely are all the syllables heard. The vowels in the first two unaccented syllables are those that are omitted. The same is true of a word like Amsterdam. The passenger may catch the last syllable, but that is about all.

One of the chief reasons, therefore, for words being easily heard is the vocal quantity—that is, especially the value, the right relative value given to all vowels and especially to unaccented vowels. Careless speakers generally speak but one vowel, the vowel that happens to fit the mouth.

In a word, each conductor should be instructed as follows: Speak always to somebody; keep a social and sympathetic attitude toward the passengers. Open the door and say to them, kindly and politely and definitely, where they are, giving them as simply as possible the name of the street or hotel. Use always the natural key of the voice. Speak as easily but definitely as possible. Take care of the little vowels. Bring out the rhythmic harmony of words. Always put kindness and interest into the voice.

GROSS RECEIPTS FOR 1904

The publication of American Street Railway Investments for 1905, "The Red Book," makes available the figures for 1904 of the principal electric railways in the country. A total of 405 companies presented detail reports of operation for 1903 and 1904, and their totals, as printed in "The Red Book," are given below. It should be stated that these reports do not in all cases represent receipts from the same amount of track for 1903 and 1904, and that the increase, in a number of examples, is due to consolidations. The fiscal year of the companies reporting is also not the same. Thus, the report for most of the roads in New York State is for the year ending June 30, 1904, and those for the roads in Massachusetts for Sept. 30, 1904. The reports of companies in the other States are in most cases either for one of the two periods mentioned or for the calendar year.

In a few cases it has been impossible to present a satisfactory report for 1904, owing to consolidations recently in progress. The two most conspicuous examples are perhaps the Public Service Corporation of New Jersey and the Consolidated Railways Company, of New Haven. Both of these companies have, therefore, been omitted from the tables below, except where they are represented by certain of their sub-companies.

The reports, as printed, show 43 companies having gross receipts of over \$1,000,000; 30 companies with receipts between \$1,000,000 and \$500,000; 144 companies with receipts between \$500,000 and \$100,000; 106 companies with receipts between \$100,000 and \$50,000, and 82 companies with receipts between \$50,000 and \$25,000.

The 1905 edition of "The Red Book" contains 415 pages of statistical matter, an increase of fifty-three pages over the edition of 1904. This is due partly to the addition of reports from new roads, partly to statements of earnings from roads which have not hitherto reported, and partly to the addition of statistical information which has not been published in previous editions of the annual.

A comparison of the gross receipts for 1903 and 1904, of the principal companies reporting, follows:

COMPANIES HAVING GROSS RECEIPTS FOR 1904 OF OVER \$1,000,000.

NAME OF COMPANY.	1903.	1904.
New York City Ry. Co., New York, N. Y....	\$15,273,363	\$21,894,004
Philadelphia Rapid Transit Co., Philadelphia, Pa....	15,436,574	16,096,362
Brooklyn Rapid Transit Co., Brooklyn, N.Y.	13,557,814	14,950,562
Manhattan Ry. Co., New York, N Y........	12,551,197	14,529,190
Boston Elevated Ry. Co., Boston, Mass.....	12,019,371	12,436,594
St. Louis Transit Co., St. Louis, Mo.........	7,295,847	†9,977,564
Pittsburg Railways Co., Pittsburg, Pa.......	9,106,083	8,665,196
Chicago City Ry. Co., Chicago, Ill.........	6,435,565	6,668,979
United Railroads of San Francisco, San Francisco, Cal....	6,243,219	6,652,630
Massachusetts Elec. Companies, Boston, Mass.	6,333,911	6,380,863
United Rys. & Electric Co. of Baltimore, Baltimore, Md....	5,571,003	5,451,180
North Jersey Street Ry. Co., Jersey City, N. J.	4,638,891	4,854,453
Detroit United Ry., Detroit, Mich...........	4,425,837	4,584,582
Cleveland Electric Ry. Co., Cleveland, O....	2,613,049	4,544,943
Twin City Rapid Transit Co., Minneapolis and St. Paul, Minn....	4,063,938	4,308,080
Cincinnati Traction Co., Cincinnati, O.......	3,697,962	3,770,022
Kansas City Ry. & Lt. Co., Kansas City, Mo.	3,187,701	3,403,125
International Ry. Co., Buffalo, N. Y........	3,663.829	3,345,574
Milwaukee Elec. Ry. & Lt. Co., Milwaukee, Wis.	3,096,324	3,285,378
The Rhode Island Co., Providence, R. I.....	2,584,153	2,754,655
Washington Ry. & Elec. Co., Washington, D.C.	2,462,294	2,644,360
Montreal Street Ry. Co., Montreal, Can.....	2,222,788	2,463,825
Toronto Ry. Co., Toronto, Ont...............	2,172,088	2,444,534
Seattle Electric Co., Seattle, Wash...........	2,096,726	2,321,235
Jersey City, Hoboken & Paterson Street Ry. Co., Hoboken, N. J....	2,076,148	2,169,014
Metropolitan West Side El. Ry. Co., Chicago.	2,153,184	2,160,941
Georgia Railway & Electric Co., Atlanta, Ga.	1,328,995	2,112,973
Louisville Ry. Co., Louisville, Ky...........	1,941.599	2,048,263
Toledo Railways & Light Co., Toledo, O....	1,663,793	1,752,602
Northwestern Elev. R. R. Co., Chicago, Ill.	1,542,040	1,724,930
United Traction Co., Albany, N. Y..........	1,624,305	1,704,742
Coney Island & Brooklyn R.R. Co., Brooklyn.	1,605,300	1,648,995
South Side Elevated R. R. Co., Chicago, Ill.	1,679,310	1,574,828
Capitol Traction Co., Washington, D. C.....	1,435,054	1,536,080
Rochester Ry. Co., Rochester, N. Y.........	1,324,353	1,499,719
Connecticut Ry. & Ltg. Co., Bridgeport, Conn.	1,228,633	1,426,160
Worcester Consolidated Street Ry. Co., Worcester, Mass....	1,324,495	1,336,441
Indiana Union Traction Co., Anderson, Ind..	1,118,951	1,341,237
Columbus Ry. & Light Co., Columbus, O....	1,284,035	1.328,802
Cincinnati, Newport & Covington Ry. Co., Cincinnati, O....	1,224,352	1,293,419
Havana Electric Ry. Co., Havana, Cuba.....	1,084,508	1,270,624
Oakland Transit Consolidated, Oakland, Cal.	1,137,041	1,258,136
Washington Water Power Co., Spokane, Wash.	801,253	1,029,006
Total, 43 companies....................	\$178,326,876	\$198,644,802

COMPANIES HAVING GROSS RECEIPTS FOR 1904 BETWEEN $1,000,000 AND $500,000.

NAME OF COMPANY.	1903.	1904.
Illinois Traction Co., Danville, Ill	$813,859	$979,078
Springfield St. Ry. Co., Springfield, Mass	915,876	947,863
Brooklyn, Queens County & Suburban R. R. Co., Brooklyn, N. Y	867,371	938,604
Hartford Street Ry. Co., Hartford, Conn	813,799	898,001
Northern Ohio Traction & Light Co., Akron, O.	882,276	895,731
Scranton Ry. Co., Scranton, Pa	827,778	873,627
Syracuse Rapid Transit Ry.Co., Syracuse, N.Y	753,277	839,373
Lehigh Valley Traction Co., Allentown, Pa.	811,668	837,632
Schenectady Ry. Co., Schenectady, N. Y.	648,763	837,119
Chicago & Oak Park Elec. Ry. Co., Chicago	834,059	824,931
Wilkes-Barre & Wyoming Valley Traction Co., Wilkes-Barre, Pa	804,182	805,179
Hamilton Cataract Power, Light & Traction Co., Hamilton, Ont	651,724	761,170
Portland R. R. Co., Portland, Me	680,210	732,969
Utica & Mohawk Valley Ry. Co., Utica, N.Y.	621,976	728,811
Grand Rapids Ry. Co., Grand Rapids, Mich.		725,128
United Power & Transportation Co., Phila.	747,024	708,512
Fonda, Johnstown & Gloversville R. R. Co Gloversville, N. Y	485,343	675,575
New York & Queens County Ry. Co., Long Island City, N. Y	619,434	661,760
Lake Shore Electric Ry. Co., Cleveland, O.	616,484	659,873
Duluth Street Ry. Co., Duluth, Minn	622,045	619,172
United Traction Co., Reading, Pa	600,368	609,806
Fort Wayne & Wabash Valley Traction Co., Fort Wayne, Ind		597,611
Tacoma Ry. & Power Co., Tacoma, Wash	493,587	579,367
Terre Haute Electric Traction & Light Co., Terre Haute, Ind	474,250	569,429
Charleston Consolidated Ry., Gas & Electric Co, Charleston, S. C	538,173	558,046
Crosstown Street Ry. Co. of Buffalo, Buffalo, N. Y		545,791
Savannah Electric Co., Savannah, Ga	519,774	544,144
Pittsburg, McKeesport & Connellsville, Ry. Co., Pittsburg, Pa		514,886
Central Pennsylvania Traction Co., Harrisburg, Pa		510,860
Cincinnati, Dayton & Toledo Traction Co., Hamilton, O	489,493	502,990
Total, 30 companies	$17,132,793	$21,483,088

COMPANIES HAVING GROSS RECEIPTS FOR 1904 BETWEEN $500,000 AND $100,000.

NAME OF COMPANY.	1903.	1904.
Puget Sound Electric Ry. Co., Tacoma, Wash.	$441,466	$499,148
Milwaukee Light, Heat & Traction Co., Milwaukee, Wis	452,931	492,228
Hudson Valley Ry. Co., Glens Falls, N. Y.	††349,218	488,672
Cleveland & Southwestern Traction Co., Cleveland, O	445,168	475,361
Conestoga Traction Co., Lancaster, Pa	409,182	468,762
Chicago & Milwaukee Elec. R. R. Co., Chicago, Ill	292,247	464,655
American Railways Co., Philadelphia, Pa	423,027	443,196
Norfolk Ry. & Light Co., Norfolk, Va	407,049	429,845
Aurora, Elgin & Chicago Ry. Co., Chicago, Ill.	191,174	427,530
Canton-Akron Ry. Co., Canton, O	385,752	424,326
Trenton Street Ry. Co., Trenton, N. J	421,640	421,941
San Francisco, Oakland & San Jose Ry., Oakland, Cal		419,349
City Ry. Co., Dayton, O	376,410	403,781
Boston & Worcester Electric Companies, Boston, Mass	171,345	400,022
Altoona & Logan Valley Elec.Ry.Co., Altoona, Pa	191,084	395,590
Ottawa Electric Ry. Co., The, Ottawa, Ont.	348,888	384,939
Holyoke Street Ry. Co., Holyoke Mass	369,337	383,411
Halifax Elec. T'way Co., Ltd., Halifax, N. S.	365,375	379,465
Elgin, Aurora & Southern Traction Co., Aurora, Ill.	453,380	379,045
Union Street Ry. Co., New Bedford, Mass	366,158	369,420
East St. Louis & Suburban Ry. Co., East St. Louis, Ill	292,228	366,591
Houston Electric Co., Houston, Tex	416,124	357,183
Norfolk, Portsmouth & Newport News Co., Norfolk, Va		342,247
Johnstown Passenger Ry. Co., Johnstown, Pa.	329,778	340,070
Winnipeg Electric Ry. Co., Winnipeg, Man.	568,226	338,503
Lexington Ry. Co., Lexington, Ky	315,461	335,464
Richmond Light & R. R. Co., S. I., N. Y.	291,219	329,934
Chester Traction Co., Chester, Pa	326,805	320,419
Chicago & Joliet Electric Ry. Co., Joliet, Ill.	301,913	316,867
Schuylkill Valley Traction Co., Norristown, Pa.	302,258	312,463
Indianapolis & Northwestern Traction Co., Indianapolis, Ind		302,283
People's Ry. Co., The, Dayton, O	265,366	298,158
New Jersey & Hudson River Ry. & Ferry Co., Hackensack, N. J	199,891	293,490
Jacksonville Electric Co., Jacksonville, Fla.	248,650	290,498
Manchester Street Ry. Co., Manchester, N. H.	267,768	285,827
Honolulu Rapid Transit & Land Co., Honolulu, Hawaii	284,319	301,966
Newton St. Ry. Co., Newton, Mass	135,304	283,542
Los Angeles & Redondo Ry. Co., Los Angeles, Cal		280,210
Toledo, Bowling Green & Southern Traction Co., Toledo, O	288,301	279,359
Lincoln Traction Co., Lincoln, Neb	251,810	272,314
Southwest Missouri Elec. Ry. Co., Webb City.	230,768	267,115
Erie Electric Motor Co., Erie, Pa	238,628	264,902
Binghamton Ry. Co., Binghamton, N. Y	238,537	251,230
El Paso Electric Co., El Paso, Tex	222,777	250,510
Rockford & Interurban Ry. Co., Rockford, Ill.	200,633	250,499
Augusta Ry. & Electric Co., Augusta, Ga	238,189	250,317
Washington, Alexandria & Mt. Vernon Ry. Co., Washington, D. C	224,665	246,491
Auburn & Syracuse Electric R. R. Co., Auburn, N. Y	121,470	240,335
Michigan Traction Co., Kalamazoo, Mich	221,168	236,199
Lewiston, Brunswick & Bath Street Ry. Co., The, Lewiston, Me	231,847	235,335
Beaver Valley Traction Co., The, Beaver Falls, Pa	227,409	233,017
Albany & Hudson R. R. Co., Hudson, N. Y.	213,551	232,790
Dayton, Springfield & Urbana Electric Ry. Co., Dayton, O	234,278	231,143
Atlantic Coast Elec. R. R. Co., Asbury Park.	221,020	231,142
Pottsville Union Traction Co., Pottsville, Pa.	219,991	227,267
Fitchburg & Leominster Street Ry. Co., Fitchburg, Mass	218,968	226,403
Cleveland, Painesville & Eastern R. R. Co., Cleveland, O	214,631	225,751
Columbus, Buckeye Lake & Newark Traction Co., Columbus, O	194,427	225,410
Niagara, St. Catharines & Toronto Ry. Co., St. Catharines, Ont	214,824	223,924
Toledo & Western Ry. Co. (The), Toledo, O.	176,766	222,005
Topeka Ry. Co., Topeka, Kan		218,000
Indianapolis & Eastern Ry. Co., Indianapolis, Ind	165,889	217,197
Eastern Ohio Traction Co., Cleveland, O	202,826	217,142
Peoria & Pekin Terminal Ry. Co., Peoria, Ill.	113,587	210,722
Evansville Electric Ry. Co., Evansville, Ind.	192,799	209,202
Western Ohio Railway Co. (The), Lima, O	121,003	205,806
Philadelphia & Lehigh Valley Traction Co., Allentown, Pa	169,114	203,804
Cape Breton Electric Co., Ltd., Sydney, N. S.	171,596	202,019
Berkshire Street Ry. Co., Pittsfield, Mass	183,091	200,295
Houghton County Street Ry. Co., Hancock, Mich	189,804	199,513
Elmira Water, Light & R. R. Co., Elmira, N.Y.	184,815	196,924
Muncie, Hartford & Ft. Wayne Ry. Co., Muncie, Ind	115,399	181,201
Newport & Fall River St.Ry.Co., Newport, R.I.	183,341	180,586
London Street Ry. Co., London, Ont	172,084	180,018
Asheville Electric Co., Asheville, N. C		178,630
Phila. & West Chester Traction Co., Phila.	136,532	174,085
Venango Power & Traction Co., Oil City, Pa.		173,172
Montreal Park & Island Ry. Co., Montreal, Can	142,868	165,890
Staten Island Midland R. R. Co., S. I., N. Y.	153,456	165,655
Cincinnati Interurban Co., Cincinnati, O		164,111
Lexington & Boston St.Ry. Co., Boston, Mass.	164,690	161,995
Pittsburg, McKeesport & Greensburg Ry. Co., Greensburg, Pa	124,553	159,058
Hoosac Valley Street Ry.Co., No. Adams, Mass.	148,828	155,530
Lehigh Traction Co., Hazleton, Pa	144,467	155,379
Columbus Railroad Co., Columbus, Ga	144,103	155,078
Citizens' Ry. Light & Power Co., Newport News, Va	150,444	155,054
Consolidated Railways, Light & Power Co., Wilmington, N. C	139,684	154,909
Schuylkill Traction Co., Girardville, Pa	104,079	154,416
Pittsfield Electric St. Ry. Co., Pittsfield, Mass.	134,952	154,168
Columbia Electric Street Ry., Light & Power Co., Columbia, S. C		153,576
Interstate Consolidated Street Ry. Co., North Attleborough, Mass	152,611	150,665
Jamestown St. Ry. Co., The, Jamestown, N. Y.	139,519	150,163
Northampton St. Ry.Co., Northampton, Mass.	151,031	149,387
Dartmouth & Westport St. Ry. Co., New Bedford, Mass	145,656	147,963
Fort Smith Light & Traction Co., Fort Smith, Ark		147,153
City Passg'r Ry. Co. of Altoona, Altoona, Pa.	145,834	145,834
Portsmouth, Dover & York Street Ry. Co., Portsmouth, N. H		143,050

NAME OF COMPANY.	1903.	1904.
Columbus, London & Springfield Ry. Co., Columbus, O.	116,718	143,425
Cincinnati, Georgetown & Portsmouth R. R. Co., Cincinnati, O.	130,631	142,966
Milford & Uxbridge Street Ry. Co., Milford, Mass	149,966	142,745
Hartford, Manchester & Rockville Tramway Co., Hartford, Conn.	133,056	139,704
Rockford, Beloit & Janesville R. R. Co., Rockford, Ill.	134,147	136,918
York Street Ry. Co., York, Pa.	107,089	136,128
Steubenville Traction & Light Co. (The), Steubenville, O.	118,077	136,089
Rockland, Thomaston & Camden St. Ry. Co Rockland, Me.	170,924	135,091
Richmond Street & Interurban Ry. Co., Richmond, Ind.		135,000
Winnebago Traction Co., Oshkosh, Wis.	127,572	133,887
St. Louis & Belleville Electric Ry. Co., East St. Louis, Ill.		133,528
Wilkesbarre & Hazelton Ry. Co., Hazelton, Pa.	91,110	133,368
Long Island Electric Ry. Co., Jamaica, N. Y.	112,901	133,127
Allentown & Reading Tr. Co., Allentown.	101,725	132,494
Dayton & Troy Electric Ry. Co., Dayton, O.	116,707	130,960
Interurban Ry. Co., Des Moines, Ia.		130,244
Fries Manufacturing & Power Co., The, Winston-Salem, N. C.	123,115	130,118
Consolidated Ry. Co., Norwich, Conn.	117,898	129,565
Valley Traction Co., Harrisburg, Pa.		127,539
Coeur D'Alene & Spokane Ry. Co., Ltd., Coeur D'Alene, Ida.		127,125
Oakwood Street Ry. Co., Dayton, O.	127,149	125,494
Kingston Consolidated R. R. Co., Kingston, N. Y.	118,447	124,783
New York & Stamford Ry. Co., Port Chester, N. Y.	116,309	122,527
Wichita R. R. & Light Co., Wichita, Kan.	109,996	119,106
Camden & Trenton Ry. Co., Camden, N. J.	85,579	117,965
Bridgeton & Millville Traction Co. (The), Bridgeton, N. J.	113,428	117,910
Sandwich, Windsor & Amherstburg Ry. Co., Windsor, Ont.	101,278	117,672
Columbus, Delaware & Marion Electric Ry. Co., Columbus, O.		115,518
Orange County Traction Co., Newburgh, N.Y.	103,827	113,615
Dayton & Xenia Transit Co., Dayton, O.	98,911	110,736
Springfield & Eastern St. Ry. Co., Palmer, Mass.	107,509	110,450
Haverhill & Amesbury St. Ry. Co., Haverhill, Mass.	109,389	109,725
Tamaqua & Lansford Street Ry. Co., Lansford, Pa.	57,090	108,669
Chicago General Ry. Co., Chicago, Ill.	92,129	108,600
Holmesburg, Tacony & Frankford Electric Ry. Co., Philadelphia, Pa.	150,147	108,395
Youngstown & Sharon Street Ry. Co., Youngstown, O.	112,200	108,291
Williamsport Pass. Ry. Co., Williamsport, Pa.	116,206	107,686
Niagara Gorge R. R. Co., Niagara, N. Y.	82,711	107,829
Boston & Maine R. R., Concord, N. H.	48,427	106,653
Dayton & Western Traction Co,. Dayton, O.	71,248	106,295
Brockton & Plymouth Street Ry. Co., Brockton, Mass.	99,600	104,059
Consolidated Ry. Co., Montville, Conn.	95,729	102,869
Olean Street Ry. Co., Olean, N. Y.	74,866	102,717
Woonsocket St. Ry. Co., Woonsocket, R. I.	118,423	102,619
Poughkeepsie City & Wappingers Falls Electric Ry. Co., Poughkeepsie, N. Y.	98,010	102,305
Citizens' Electric Street Ry. Co., Newburyport, Mass.	97,586	102,060
Madison Traction Co., Madison, Wis.	88,817	101,454
Seattle, Renton & Southern Ry. Co., Seattle, Wash.	59,040	100,002
Total, 144 companies.	$25,345,141	$31,783,234

COMPANIES HAVING GROSS RECEIPTS FOR 1904 BETWEEN $100,000 AND $50,000.

NAME OF COMPANY.	1903.	1904.
Ithaca Street Ry. Co., Ithaca, N. Y.	$109,090	$99,721
Stamford St. R. R. Co., Stamford, Conn.	83,194	98,985
Zanesville Ry., Light & Pwr. Co., Zanesville, O.	151,017	98,621
Alton, Granite & St. Louis Trac. Co., Alton, Ill.	90,039	98,524
Cumberland & Westernport Electric Ry. Co., Cumberland, Md.	91,211	96,925
Dayton & Northern Traction Co., Dayton, O.	96,930	94,537
Maumee Valley Railways & Lt. Co., Toledo, O.	97,507	94,437
Jefferson Traction Co., Punxsutawney, Pa.	66,046	93,049

NAME OF COMPANY.	1903.	1904.
Paducah City Ry. (Incor.), Paducah, Ky.	88,340	91,801
Augusta, Winthrop & Gardiner Ry. Co., Augusta, Me.	91,996	91,592
Washington & Canonsburg Ry. Co., Washington, Pa.	71,991	90,614
New Jersey & Pennsylvania Traction Co., Trenton, N. J.	70,240	90,184
Denison & Sherman Ry. Co., Sherman, Tex.	93,850	89,449
Natick & Cochituate St. Ry. Co., Natick, Mass.	88,923	89,438
Delaware Co. and Philadelphia Electric Ry. Co., Philadelphia, Pa.	87,788	89,392
Hamburg Ry. Co., Hamburg, N. Y.	75,090	88,538
Augusta & Aiken Ry. Co., Augusta, Ga.		87,868
Warren St. Ry. Co., Warren, Pa.	82,[illegible]07	87,560
Bangor Street Ry. Co., Bangor, Me.	74,876	86,791
Fox River Elec. Ry. & Power Co. Green Bay, Wis.	75,682	86,689
Danbury & Bethel St. Ry. Co., Danbury, Conn.	81,476	86,566
Northampton Traction Co., Easton, Pa.	71,802	85,171
Ohio Central Traction Co., Galion, O.		85,055
Burlington Traction Co., Burlington, Vt.	74,034	84,882
Hull Electric Co. (The), Hull, Que.		84,872
Pennsylvania & Ohio Ry. Co., Ashtabula, O.	73,063	84,822
Dayton, Covington & Piqua Traction Co., Dayton, O.	54,230	84,395
Shamokin & Mt. Carmel Electric Ry. Co., Shamokin, Pa.	62,726	84,039
Syracuse & Suburban R. R. Co., Syracuse, N. Y.	75,032	84,007
Hudson, Pelham & Salem Electric Ry. Co., Hudson, N.H.	50,681	83,906
Syracuse, Lakeside & Baldwinsville Ry. Syracuse, N. Y.	87,976	83,791
Montreal Terminal Ry. Co. (The), Montreal, Can.		83,686
Dover, Somersworth & Rochester St. Ry. Co., Dover, N. H.	91,929	83,069
Woronoco Street Ry. Co., Westfield, Mass.	77,220	82,725
Peekskill Lighting & R. R. Co., Peekskill, N.Y.	76,052	82,303
Portsmouth Street R. R. & Light Co., Portsmouth. O.	69,277	81,876
Kokomo Street Ry., Light & Power Co., Kokomo, Ind.	62,238	81,437
Hartford & Springfield Street Ry. Co., Thompsonville, Conn.	72,293	81,033
Providence & Danielson Ry. Co., Providence, R. I.	122,518	80,809
Lebanon Valley Street Ry. Co., Lebanon, Pa.	81,835	79,654
Milford, Attleboro & Woonsocket Ry. Co., Milford, Mass.	76,849	78,875
Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Co., Geneva, N. Y.	73,017	78,574
Atlantic City & Suburban Traction Co., Atlantic City, N. J.		78,419
Oneonta, Cooperstown & Richfield Springs Ry. Co., Oneonta, N. Y.	64,188	77,979
Consolidated Ry. Co., New London, Conn.	72,504	77,282
Citizens Light & Transit Co., Pine Bluff, Ark.		77,008
Bristol & Plainville T'way Co., Bristol, Conn.	51,305	75,744
Evansville & Princeton Trac. Co., Princeton, Ind.		73,517
Rochester & Suburban Ry. Co., Rochester, N. Y.	56,316	73,380
Blue Hill Street Ry. Co., Canton, Mass.	37,232	72,864
Lewistown & Reedsville Electric Ry. Co., Lewistown, Pa.	58,185	72,860
Trenton & New Brunswick R. R. Co., Trenton, N. J.	39,195	72,404
Ashland Light, Power & Street Ry. Co., Ashland, Wis.	25,123	72,295
Nashua Street Ry. Co., Nashua, N. H.		72,286
Media, Middletown, Aston & Chester Elec. Ry. Co., Chester, Pa.	64,716	72,232
Black River Traction Co., Watertown, N. Y.	66,156	70,877
South Middlesex St. Ry. Co., Natick, Mass.	72,217	69,591
Granite City & St. Louis Ry. Co., Venice, Ill.		68,971
Philadelphia, Bristol & Trenton St. Ry. Co., Philadelphia, Pa.	65,237	68,402
Worcester & Blackstone Valley Street Ry. Co., Worcester, Mass.	67,910	67,685
Athens Electric Ry. Co., Athens, Ga.	62,638	67,131
Portsmouth Electric Ry., Portsmouth, N. H.	65 266	66,487
Danville Ry. & Electric Co., Danville, Va.	63,471	65,742
Greenfield & Turner's Falls St. Ry. Co., Greenfield, Mass.	62,785	65,703
Youngstown Park & Falls Street Ry. Co., Youngstown, O.	82,412	65,553
Berkley Street Ry. Co., Berkley, Va.	61,534	65,396
New Bedford & Onset Street Ry. Co., New Bedford, Mass.	91,721	65,279
Chambersburg, Greencastle & Waynesboro Street Ry. Co., Waynesboro, Pa.		65,184
Toledo & Indiana Ry. Co., Toledo, O.		65,172
Meriden, Southington & Compounce Tramway Co., Meriden, Conn.	59,706	65,087

NAME OF COMPANY.	1903.	1904.
Washington, Arlington & Falls Church Ry. Co., Washington, D. C.	64,038	65,065
Greenwich Tramway Co., Greenwich, Conn.	46,607	64,699
Erie Traction Co., Erie, Pa.	65,669	64,650
Waverly, Sayre & Athens Traction Co., Waverly, N. Y.	56,821	64,116
Warren, Brookfield & Spencer Street Ry. Co., Brookfield, Mass.	66,415	63,512
Olean, Rock City & Bradford R.R. Co., Bradford, Pa.	64,602	63,106
Toledo, Fostoria & Findlay Electric Ry. Co., Findlay, O.	61,845	62,771
Newton & Boston Street Ry. Co., Newton, Mass.	67,151	62,074
Hudson River Traction Co., Rutherford, N.J.	42,907	61,955
Bangor, Orono & Oldtown Ry. Co., Bangor, Me.	60,850	61,909
Gardner, Westminster & Fitchburg Street Ry. Co., Gardner, Mass.	59,237	61,504
Newtown Electric St. Ry. Co., Newtown, Pa.	54,559	61,375
New York & Long Island Traction Co., Hempstead, N. Y.	34,677	60,301
Columbia & Montour Electric Ry. Co., Bloomsburg, Pa.	69,668	59,982
Uniontown & Monongahela Valley Electric Ry. Co., Uniontown, Pa.		59,825
Dunkirk & Fredonia R. R. Co., Fredonia, N.Y.	55,801	59,111
Biddeford & Saco R. R. Co., Biddeford Me.	56,992	58,498
Northampton & Amherst Street Ry. Co., Northampton, Mass.	56,746	57,666
Freeport Ry., Light & Power Co., Freeport, Ill.		57,500
Wilkesbarre, Dallas & Harvey's Lake Ry. Co., Wilkesbarre Pa.	53,850	57,166
Tarentum Traction Passenger Ry. Co., Tarentum, Pa.	51,411	56,904
West Chester Street Ry. Co., West Chester, Pa.	35,502	56,586
Chillicothe Elec. R. R., Light & Power Co., Chillicothe, O.	50,347	56,229
Sea View R. R. Co., Wakefield, R. I.	47,330	56,051
Springfield & Xenia Ry. Co., Xenia, O.		55,795
Van Brunt St. & Erie Basin R.R. Co., Brooklyn.	53,609	55,794
Southwestern Street Ry. Co., Philadelphia, Pa.	54,581	55,445
Lawrence & Methuen Street Ry. Co., Lawrence, Mass.	52,268	55,335
Bradford Electric St. Ry. Co., Bradford, Pa.	52,240	54,759
Torrington & Winchester Street Ry. Co., Torrington, Conn.	50,967	54,194
Concord, Maynard & Hudson Street Ry. Co., Maynard, Mass.	58,877	53,946
Central Market Street Ry. Co., Columbus, O.	18,065	51,512
Citizens' R. R., Light & Power Co., Fishkill, N. Y.	51,444	51,081
Greenfield, Deerfield & Northampton Street Ry. Co., Greenfield, Mass.	26,837	50,753
Norfolk & Bristol Street Ry. Co., Norwood, Mass.	54,703	50,011
Total 106 companies,	$6,107,198	$7,661,972

COMPANIES HAVING GROSS RECEIPTS FOR 1904 BETWEEN $50,000 AND $25,000.

NAME OF COMPANY.	1903.	1904.
Union Traction Co., Santa Cruz, Cal.	$	$49,500
Suburban R. R. Co., Chicago, Ill.	45,985	49,487
Tiffin, Fostoria & Eastern Electric Ry. Co., Tiffin, O.	47,386	49,088
Consolidated Ry. Co. (The), Middletown, Conn.	41,905	49,033
Norton & Taunton Street Ry. Co., Norton, Mass.	48,180	48,864
Farmington Street Ry. Co., The, Hartford, Conn.	37,922	48,850
Butler Passenger Ry. Co., Butler, Pa.	47,001	48,641
Sharon & Wheatland Street Ry. Co., Sharon, Pa.	63,995	48,503
International Transit Co., Sault Ste Maire, Ont.		48,439
Wallkill Transit Co., Middletown, N. Y.	47,093	48,386
Cortland County Traction Co., Cortland. N.Y.	42,551	47,985
Hamilton, Grimsby & Beamsville Electric Ry. Hamilton, Co., Ont.		47,419
Exeter, Hampton & Amesbury Street Ry. Co., Exeter, N. H.	86,879	47,296
Taunton & Pawtucket Street Ry. Co., Taunton, Mass.	57,639	47,219
Oswego Traction Co., Oswego, N. Y.	38,373	47,178
Providence & Fall River Street Ry. Co., Swansea Centre, Mass.	44,460	46,938
Monmouth County Electric Co., Red Bank, N. J.	46,352	46,923
Coal Belt Electric Ry. Co., Marion, Ill.		45,995
Ohio River Electric Ry. & Power Co., Pomeroy, O.	49,558	45,591
Pottstown Passenger Ry. Co., Pottstown, Pa.	44,262	45,585
Waterville & Fairfield Ry. & Light Co., Waterville, Me.	62,911	44,576
Easton Transit Co., Easton, Pa.		44,519
Burlington County Ry. Co., Moorestown, N. J.		44,269
Coney Island & Gravesend Ry. Co., Brooklyn, N, Y.	36,312	44,082
Branford Street Ry. Co., Branford, Conn.	59,645	44,060
Portland & Brunswick Street Ry. Co., Brunswick, Me.	28,954	42,502
Templeton Street Ry. Co., Templeton, Mass.	47,532	42,373
Corning & Painted Post Street Ry. Co., Corning, N. Y.	38,156	41,833
Galt, Preston & Hespeler Street Ry. Co., Ltd., Galt, Ont.		41,017
Berlin Street Ry. Co. (The), Berlin, N. H.		40,876
Valley Street Ry. Co., Sharon, Pa.	42,431	40,640
Kittanning & Ford City Street Ry. Co., Kittanning, Pa.	42,313	40,323
Meadville & Cambridge Springs Street Ry. Co., Meadville, Pa.		40,302
Columbus, Grove City & Southwestern Ry. Co., Columbus, O.		40,258
Charlottesville & Albermarle Ry. Co., Charlottesville, Va.		40,228
Oshawa Ry. Co. (The), Oshawa, Ont.		40,183
Haverhill & Southern New Hampshire Street Ry. Co., Haverhill, Mass.	35,652	39,978
Bennington & Hoosick Valley Ry. Co., Hoosick Falls, N. Y.	39,610	39,681
Athol & Orange Street Ry. Co., Athol, Mass.	40,385	39,513
Elmira & Seneca Lake Ry. Co., Elmira, N.Y.	36,968	39,461
Springfield Electric Ry. Co., Springfield, Vt.	36,554	39,310
Phillipsburg Horse Car R. R. Co., Phillipsburg, N. J.	40,358	38,789
Meadville Traction Co., Meadville, Pa.	35,797	37,986
Barre & Montpelier Traction & Power Co., Barre, Vt.	35,164	37,898
Kenosha Electric Ry. Co., Kenosha, Wis.	23,883	36,789
Citizens' Electric Co., Eureka Springs, Ark.	30,301	36,504
People's Street Ry. Co., Nanticoke, Pa.	25,620	36,042
Worcester & Holden Street Ry. Co., Holden, Mass.		36,244
Levis County Ry. Co., Levis, Que.		35,044
Paris Transit Co., Paris, Tex.	32,704	34,781
East Taunton Street Ry. Co., Taunton, Mass.	35,257	34,644
Southbridge & Sturbridge Street Ry. Co., Southbridge, Mass.	43,675	34,582
Landsdale & Norristown Electric Ry. Co., Norristown, Pa		34,341
Titusville Electric Traction Co., Titusville, Pa.	31,862	34,201
Jersey Central Traction Co., Keyport, N. J.		33,802
Marlborough & Westhorough Street Ry. Co., Westborough, Mass.	36,239	33,703
Penobscot Central Ry. Co., Bangor, Me.	33,808	33,358
Springfield, Troy & Piqua Ry. Co., Springfield, O.		32,833
Shamokin & Edgewood Electric Ry. Co., Shamokin, Pa.	28,502	32,828
Vallamont Traction Co., Williamsport, Pa.	28,063	32,060
Columbian Street Ry. Co., Pascoag, R. I.	25,470	32,474
Columbus, New Albany & Johnstown Ry. Co., Columbus, O.	32,948	31,999
Millville Traction Co., Millville, N. J.	30,336	31,385
Amherst & Sunderland Street Ry. Co., The, Amherst, Mass.	29,413	31,634
Sharon & Newcastle Street Ry. Co., Sharon, Pa.	29,791	30,510
Troy & New England R. R. Co., Troy, N.Y.	27,385	29,577
Port Jervis Electric Light, Power, Gas & R. R. Co., Port Jervis, N. Y.	27,176	29,544
Sarnia Street Ry. Co., Sarnia, Ont.		29,449
Carbon Street Ry. Co., Mauch Chunk, Pa.	29,668	29,412
Lake Erie, Bowling Green & Napoleon Ry. Co., Bowling Green, O.	25,873	29,146
Somerset Traction Co., Skowhegan, Me.	28,583	28,469
Ogdensburg Street Ry. Co., Ogdensburg, N.Y.	29,200	28,029
Calais Street Ry. Co., Calais, Me.	29,513	27,953
Bangor, Hampton & Winterport Ry. Co., Bangor, Me.	28,617	27,357
Hampshire & Worcester Street Ry. Co., Ware, Mass.	28,654	27,283
Keene Electric Ry. Co., Keene, N. H.		26,844
Willimantic Traction Co., Willimantic, Conn.		26,767
York & Dover Electric Ry. Co., York, Pa.	20,533	25,871
Laconia Street Ry. Laconia, N. H.		25,867
People's Traction Co., Galesburg, Ill.		25,853
Latrobe Street Ry. Co., Latrobe, Pa.	21,632	25,201
Grand Valley Ry. Co., Brantford, Ont.		25,085
Total, 82 companies,	$2,242,989	$3,138,982

† Exposition period. ‡ Decrease due to strike.

THE QUESTION BOX

This week a number of answers are published that are of special interest to power house engineers. Answers pertaining to the line and track departments are also given.

A.—GENERAL

A 36a.—Based upon experience, what is a proper rate per mile for interurban passenger business, and to what extent should these rates be reduced by the sale of commutation tickets, monthly tickets, coupon books, etc?

I think that depends largely upon local conditions and population served. We operate two lines through rather sparsely settled communities. Our cash fare on the interurban lines is at the rate of 2½ cents a mile. Round-trip tickets are at the rate of 2 cents a mile. Commuters' tickets are at the rate of 1.6 cents per mile. Half-fare tickets for children under twelve are sold at just half the adult round-trip ticket rate. On our line to Golden, where our fare is 50 cents a round trip, there are two steam roads competing; one has a 40-cent round-trip rate, and the other has a 25-cent round-trip rate. The electric road, however, does more business than both of the other roads combined, on account of its more frequent and more pleasant service. JOHN A. BEELER, V. Pres. & Gen. Mgr., Denver City Tramway Co.

A 36b.—How do you handle your half-fares?

We are required by one of our franchises to sell half-fare tickets. We sell them at the rate of ten for 25 cents for children under twelve years of age. We sell these tickets at the company's central office only, in amounts not to exceed $1 worth. We were troubled greatly about a year ago with storekeepers buying these tickets and retailing them to their customers at cost price, or at the rate of three for a dime. The city authorities amended the ticket brokers' license to include all street car tickets, and it is now necessary for anyone wishing to re-sell these car tickets to take out a ticket broker's license at a cost of $100 per annum, which, of course, no one has done. This confines the selling of all half-fare tickets to the company's office. JOHN A. BEELER, V. Pres. & Gen. Mgr., Denver City Tramway Co.

F.—STEAM ENGINEERING

F 7.—How do you locate breaks in boiler setting?

By means of soot marks on the edge of the opening. Tests can be made with candle flame held near the cracks.
E. G. HINDERT, Ch. Eng., Cleveland & Southwestern Tract. Co.

F 27.—What ingredients in feed water cause scale formation in the boilers? What are the neutralizers in each case?

The principal ingredients in waters causing scale in this vicinity are carbonate of lime and sulphate of lime, and sulphate of magnesia. Caustic soda will usually counteract the carbonate and sulphate of lime. E. G. HINDERT, Ch. Eng., Cleveland & Southwestern Tract. Co.

F 28.—How can the engineer of a small power station, without consulting a chemist, determine the scale-forming ingredients of the feed water he is using, with a view of injecting neutralizing chemicals?

"Engineer" is advised that the analysis of feed water can be satisfactorily carried out only by a chemist who has been trained in this class of work, and he is advised to submit samples of the water to the nearest competent chemist. If the samples are to be sent through the mails, it is well to take the following precautions. Four samples of the feed water should be taken, two in summer, one during a dry spell and the other about two days after a heavy rainfall, and two in winter, one during a frosty spell and the other about two days after a heavy thaw. These samples should be placed in glass-stoppered Winchester quart bottles, similar to those used by druggists for liquid reagents. Before filling, the bottles should be well scoured and rinsed out several times with the feed water, and they should then be filled with the samples, leaving a little space empty at the top. That the bottles should not be filled completely is due to the fact that it is necessary to allow for expansion caused by changes in temperature. The bottles should then be turned upside down and the necks and stoppers dipped in melted beeswax. They should then be labeled with names of the company and the sampler, the source of supply, the date and time of taking, preceding weather conditions, and the purpose for which the water is to be used. The samples, as soon as the foregoing has been carried out, should be packed with excelsior in a wooden box, and be at once mailed or expressed to the nearest competent chemist. With the data obtained from the chemist in conjunction with the study of literature pertaining to feed water and boiler scale, "Engineer" should be able to obtain satisfactory results.
J. STANLEY RICHMOND, Cons. Expert, New York City.

He could try the different neutralizers, but could not tell how much to use. E. G. HINDERT, Ch. Eng., Cleveland & Southwestern Tract. Co.

F 29.—Is it practicable to use soda ash for purifying boiler feed water? What are the objections? Under what conditions should soda ash be used, and in what quantities?

Yes, but care must be used to prevent boiler from foaming. It would be best to use it in connection with settling tanks. Quantities used should be based upon a chemical analysis.
E. G. HINDERT, Ch. Eng., Cleveland & Southwestern Tract. Co.

It is practical to use soda ash for softening boiler water. It is liable, however, to cause foaming if used too freely. Blow off frequently if water is bad. Soda ash should be used when carbonate of lime is present, and this is one of the most common scale-forming elements. It is a little difficult to tell the quantity to use, as the water of different and even the same localities varies so. One must get at the quantity by experience. If too much is used it usually causes trouble worse than the scale. A chemical analysis of the water and treatment according to conditions is the only safe method to follow.
CHAS. H. COX, Gen. Mgr., Lincoln (Neb.) Tract. Co.

F 30.—Under what conditions can kerosene be used to advantage in boilers? What are the objections to the use of kerosene?

Kerosene should be used only when the boiler is empty and dry. It should be fed to the boiler in small quantities at a time through the blow-off, and the boiler allowed to slowly fill with water. The objections to kerosene are its odor and its tendency to cause "bogged" tubes and plates. E. G. HINDERT, Ch. Eng., Cleveland & Southwestern Tract. Co.

Kerosene will remove scale from boilers but it is liable to cause foaming, and if used too freely will corrode the boiler and tubes, and pitt them full of little holes. The kerosene will get into the lap joints, and sometimes give trouble from this source.
CHAS. H. COX, Gen. Mgr., Lincoln (Neb.) Tract. Co.

F 31—Will zinc placed in a steam boiler prevent scale or corrosion? Under what conditions of feed water impurity should zinc be used?

Yes. Zinc can be used in waters having acid properties. It will aid in preventing corrosion of boilers. E. G. HINDERT, Ch. Eng., Cleveland & Southwestern Tract. Co.

F 32.—What is the best method of feeding purifying compounds into a boiler?

By means of a barrel placed above boiler feed-pump with a pipe connected to the suction of the boiler feed-pump, or better, if possible, to the suction of the heater pump if it is an open heater, thereby depositing some of the scale-forming matter in the heater before the boiler is reached. E. G. HINDERT, Ch. Eng., Cleveland & Southwestern Tract. Co.

F 38.—How do you test vacuum enclosing pipes and vessels for leakage?

Put a vacuum gage on pipes or vessels and note vacuum every few minutes. Or take a candle and inspect all joints by holding candle close to joint to see if flame be drawn in. Also listen for sound of air being drawn in. E. G. HINDERT, Ch. Eng., Cleveland & Southwestern Tract. Co.

By means of a lighted torch, or better yet, a candle. Hold the flame close to where the leak is suspected, and if there is an opening the flame will be drawn in.
CHAS. H. COX, Gen. Mgr., Lincoln (Neb.) Tract. Co.

F 47.—What is a quick and sufficiently accurate method of determining the comparative values of different grades and kinds of coal for boiler firing purposes?

Make a ten-hour test of each kind, weighing coal and ashes, and measure boiler feed water. E. G. HINDERT, Ch. Eng., Cleveland & Southwestern Tract. Co.

By making short tests, say of ten hours each. Weigh the coal and water, and the coal that evaporates the most water per pound of coal can be counted as the best coal.
CHAS. H. COX, Gen. Mgr., Lincoln (Neb.) Tract. Co.

For answers to this question and to Questions Nos. F-48 and F-60 see articles on "Fuel, Ash and Gas Testing" in the STREET RAILWAY JOURNAL for Feb. 4 and Feb. 11, 1905.
J. STANLEY RICHMOND, Cons. Expert, New York City.

F 48.—In a small or medium-size station, what is the best method of determining amount of coal consumed? Give details.

Make an estimate on the first of each month of coal on hand and keep account of carloads received with capacities of cars. This will in ordinary cases give fairly accurate results. Check these by occasional tests of twenty-four hours' duration, weighing coal and ashes. E. G. HINDERT, Ch. Eng., Cleveland & Southwestern Tract. Co.

F 65.—Have you ever tried injecting a jet of steam under boilers to raise steam pressure at times of heavy demands? Give details of arrangement and result secured.

I have tried a jet of steam, blowing back directly over the fire. As viewed from the rear it showed a white sphere of burning flame. I could have increased its efficiency by allowing air to be drawn in with it. One method I have seen opens a draft door back of jet and blows three minutes, and then shuts off automatically. I understand the device is efficient and prevents smoke if carefully used. E. G. HINDERT, Ch. Eng., Cleveland & Southwestern Tract. Co.

F 70.—What is a simple method of determining roughly the draft of a chimney, where absolute accuracy is not required?

Take a glass tube about 1 foot long and bend it U-shape. Fill with water and attach one end to the opening in the chimney by means of a rubber tube. Leave the other end open. The water will have a tendency to go over into the chimney. Take a rule and measure the difference in height of the two columns of water. This will give you your draft in inches of water.
CHAS. H. COX, Gen. Mgr., Lincoln (Neb.) Tract. Co.

G.—THE ENGINE ROOM

G 3.—Is it possible to run a commercial lighting or power load from generating units that are supplying current for railway purposes? How can it be done? What is the best method of regulation in such case to prevent fluctuations in the lighting or power circuit?

It is possible and entirely practicable to run commercial lighting from generating units supplying current for railway work. This may be done without any difficulty from d. c. generator, providing the same is not overloaded for railway purposes. The most economical and satisfactory method, however, is to install, when the plant is built, an alternator of single-phase with an a. c.-d. c. motor generator set in the station. In this case you will find little or no difficulty in supplying current for lighting purposes, with an up-to-date regulator installed on the lighting lines at the station.
CHAS. H. COX, Gen. Mgr., Lincoln (Neb.) Tract. Co.

G 7.—Do you know of any satisfactory schemes whereby all employees of a power plant can participate in a bonus when station is operated at especially good economy? Give details and results obtained.

A certain percentage, based on total annual salary, *i. e.*, the employee receiving a dividend on his capital (labor) invested the same as a stockholder receives dividend on his.
O. A. HONNOLD, Opr. Eng., Utah Light & Ry. Co., Salt Lake City.

On general principles the bonus scheme of letting the employees participate in a profit that is gained by exceptional economy is worthy of a great deal of consideration, and such a scheme can be operated to be productive of good results. Words of encouragement and other manifestations of appreciation of efforts of individuals will in most cases accomplish substantial results.
CHAS. H. COX, Gen. Mgr., Lincoln (Neb.) Tract. Co.

At one time we followed the practice of giving a $10 bonus every month to the fireman who made the best showing as regards amount of fuel consumed per unit. We employ three firemen, each one of which has an eight-hour shift each day, and we rotate the shifts so that each man will have the same conditions to meet as the others. We abandoned the system of bonuses, however, partly on account of the fact that we had a well defined suspicion that the firemen were dividing the bonus among themselves every month. so that each man received one-third of the $10 no matter who received the bonus, and there was, therefore, no incentive to any one of the men to exert himself unduly. Since we abolished the bonus system we are getting better firing than we had before.
GENERAL MANAGER.

G 8.—A young engineer, who has yet to win his spurs, has been given charge of the power house on a twenty-car road. He had been asked by the manager to carry out a general efficiency test of the entire station. He wants suggestions from some of the older heads as to some of the things he should and should not do in carrying out these tests. He wants to know how to dispose his available forces so as to obtain the data without taking on additional help. If your manager should ask you to make tests and report on just what each department of the power house was doing and could do, how would you go about it to get the information? This is a matter especially worthy of discussion. Suggestions are particularly requested.

"Young Engineer" is not advised to undertake the efficiency tests of the whole station. This, because such tests require a trained corps of assistants and a considerable amount of apparatus. He can, however, "win his spurs" by a much simpler and more satisfactory and practical method. This will require about three months of work as follows:

The first month should be devoted to testing the fuel, fuel gas and ash; also to taking indicator diagrams and examining engine bearings and other parts for wear and lost motion; also to examining generator commutators, brushes, bearings and connections. The switchboard, line and rail connections to the overhead and return feeders should also be carefully looked over, and the motormen should be watched to see that they are operating the controllers carefully. Records should be collected during this month of the amount of fuel and other supplies consumed, the total electrical output of the station, the number of car-miles run, and the amount of gross receipts taken in. The rail bonds all over the system should also be tested.

During the second month the firemen can be trained to admit either more or less air to the fires (according to the results of the tests of ash, gas and fuel previously made); lost motion of the engines should be taken up and other necessary improvements made both on generators and steam units. All cable connections both in the power house and outside should be gone over; all rail bonds showing a drop greater than the drop on 6 ft. of straight rail should be rebonded; motormen should be trained to accelerate rapidly and then coast by switching on to the last point and shutting off as soon as possible, thereby saving power; and other necessary improvements should be made.

During the third month the engineer should collect records of fuel and other supplies used, the total electrical output of the station, the number of car-miles run, and the total gross receipts of the company.

Reports should then be prepared covering the three months work, and be submitted to the general manager. If "Young Engineer" has good common sense he will then find that he has "won his spurs." He is reminded, however, that nothing in nature's laboratory stands still, and that winning of spurs and retaining of spurs are two different matters. The latter requires never ceasing exertion. J. STANLEY RICHMOND, Consulting Expert, New York City.

The most important thing your manager wants to know about his station is, what it costs him to produce a kw-hour at the switchboard. He will want to know the cost of coal, oil, waste, water, labor, repairs and all the other individual items that go to make up the total cost of the kw-hour, so that those items which are higher than necessary can be cut down.

Your manager does not care whether the steam boiler has an efficiency of 67½ per cent or not. What he wants to know is how many pounds of water he is evaporating per pound of coal, so he can compare notes with his neighbor and satisfy himself that he is getting the best results possible. Your manager cannot change the efficiency of his boilers. All he can do is to remove the scale and incompetent firemen, etc.

It is of no use to know the efficiencies of the generators at different loads. The manager cannot change that if he knew. Only the manufacturers in the first place could have made such a change.

The same is nearly as true of the engines when you have the valves set as they should be. He might cover the header better, but he cannot change the efficiency of the engine. He does not care about the thermal efficiency of his engine. The question is, how little steam can he make it use per kw-hour or hp-hour.

Before you make any tests see that all your instruments and scales are of the standard calibration. During the tests see that the men do not make errors in taking and recording readings. Have a common log and keep all data on that. Select a reliable man for log-keeper. Weigh the water and coal accurately and get the station output. Take readings about every 15 minutes for 24 hours. The coal is usually the largest item of cost and should be watched most closely.

The firemen should be watched. Some men will burn up their wages several times a day by careless firing. Such men are undesirable. In running a test you must watch the firemen, as they will steal coal and fire with it. It is really the best plan to get disinterested parties to weigh the coal. If the firemen weigh it your evaporation will show high. Perhaps you have more firemen than are necessary. The same may be true of engineers, oilers and switchboard attendants.

Waste seems to be a small item, but oftentimes it is used extravagantly.

The cost of water you cannot change much, unless you are wasting it.

Repairs can be cut down by keeping your eyes open and seeing that everything is in good working condition.

Boiler compounds may be replaced by cheaper methods, perhaps mechanical methods or some other form of compound from that you are now using.

The various kinds of oil, as cylinder, pump, engine, bearing, etc., should be carefully measured for this twenty-four-hour test, and the amounts that go to each bearing or engine should be determined.

After having made a series of tests you will then be in a position to determine the actual cost of each item of cost per kw-hour, at which time it is an excellent idea to compare notes with the engineers having in charge stations of a similar character and size, thus placing one in a position to know these items of cost in good practice for similar conditions or for his particular locality.

Chas. H. Cox, Gen. Mgr., Lincoln (Neb.) Tract. Co.

H.—THE LINE DEPARTMENT

H 1.—Please state in detail what trouble you have had with lightning on any part of the transmission or distribution system. Then, please state in full, what steps you have taken to prevent damage from lightning.

Previous to 1904 the Central Pennsylvania Traction Company during heavy lightning storms would frequently burn out from one to twelve cars, and it was not uncommon for us to lose from one to two generator armatures during a season, as the result of lightning discharges. In the spring of 1904 we installed lightning arresters on two of our divisions, each of which is 9 miles long, placing the arresters five to the mile. One of the divisions passes our power station. Since this installation we have not lost one generator armature by lightning, and have had but very few cars burn out on these divisions. But after lightning storms we generally find some of the lightning arresters burned out, and in some cases the boxes knocked from the poles. We dig a hole 4 ft. deep and bury an iron plate, 12 ins. x 12 ins. x 5-16 in., in charcoal with a bond terminal compressed in the plate, and to this terminal is soldered a No. 6 wire, the other end of which is soldered to feeder tap or feeder proper. P. Frank Gerhart, Ch. Elec., Central Pennsylvania Tract. Co., Harrisburg.

In the operation of high-tension transmission lines the only destruction to apparatus occurring through lightning has been confined to the lightning arresters themselves. Various styles and makes were used. Their weak points were in their inability to arrest or interrupt the generator current that followed the discharge, and which proved very effective in putting them out of business. A high-tension switch and fuse installed in each line-arrester circuit proved a valuable protection.

Choke coils are used on each line, the discharge circuit tapped on the line side of the coils. A barb wire placed above the lines, attached to the top of poles by staples, proved a greater menace than a safeguard, due largely to breakage from corrosion at the staples. The best quality of wire attached to insulators at each pole and grounded every fourth pole has been undoubtedly of great value.

F. H. Brooks, Supt., Lincoln (Neb.) Tract. Co.

H 3.—What is the most efficient method of protecting high-tension lines from contact with trees?

Where continuous operation is demanded, it is absolutely necessary to either clear the trees entirely by poles of different height to carry the line above them, or to obtain concessions whereby the trees can be removed a safe distance on either side.

F. H. Brooks, Supt., Lincoln (Neb.) Tract. Co.

Where it is possible cut all trees down that would, if they fell, come in contact with the high-tension lines. Where they cannot be cut down trim them as far away from the lines as possible.

Columbus, Buckeye Lake & Newark Tract. Co. and Columbus, Newark & Zanesville Elec. Ry. Co.

The best practice is either to carry the wire over the top or else cut down the tree, even though it has to be bought at some expense, for in times of storms and during the change of seasons almost all devised protective schemes prove inefficient.

H. A. Tiemann, New York City.

H 4.—What is the best form of cradle or other device for catching broken high-tension lines at highway crossings, or where the lines cross over or under other wires?

The high-tension wire should be invariably placed above all other wires at crossings. A very satisfactory protective device consists in stringing between the two poles of the line to be protected, as close to their tops as possible, a steel cable or rope of such size that it will safely carry at least three times the normal current in the power wires, this rope to be thoroughly grounded. Below this wire an insulated screen of 10 to 14 No. 6 galvanized iron wires is stretched between the poles and just above the wire to be protected, and extending a foot on each side and beyond them. Should a transmission line wire break, the grounded wire being directly in its path, will either operate the safety devices at the station, or fuse the power wire, which falling on the insulated screen protects the wires to a considerable extent. F. H. Brooks, Supt., Lincoln (Neb.) Tract. Co.

I.—THE TRACK DEPARTMENT

I 4a.—Have you any T-rails in paved streets? If so, what has been the experience with this track? Has it proved to be a serious obstacle to vehicle travel?

Our experience with T-rails in use nearly six years on business streets where traffic is heavy and constant warrants our assertion that it is superior to any other type of rail for streets of ordinary city traffic. It has not been considered objectionable to vehicle traffic. The abutting pavement is fully as good as that further removed, and shows appreciably less wear than the same pavement adjoining girder rail. F. H. Brooks, Supt., Lincoln (Neb.) Tract. Co.

I 30.—What has been the experience with soldered bonds?

This company has had 3000 soldered bonds in service for the past ninety days. So far only one of them has come loose. The bond is soldered to the ball of the rail. To our mind the bond we are using is the best type of bond on the market for conductivity and cheapness, both as regards installation and maintenance.

A. B. Skelding, Gen. Mgr., Consolidated Rys., Light & Power Co., Wilmington, N. C.

Soldered bonds are good, yes, very good. To be guilty of "double entente," they have come to stay.

J. Stanley Richmond, Con. Expert, New York City.

I 34.—What is the best method of preventing switches from "kicking"?

Switches may be prevented from kicking by attaching a spring lock to the tongue near the point. Switches provided with an adjustable bushing give little trouble, as the heel of the tongue can be held tightly. A. W. Kennedy, Asst. Eng., United Rys. Co., of St. Louis.

I 35.—How many renewals of hard centers can be made on modern special work before the abutting rails are worn out?

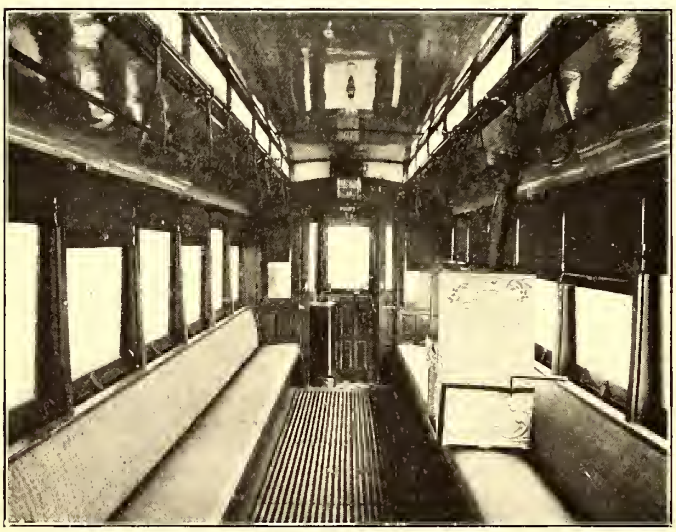
Depends on quality of steel in the renewable plate. One plate should last as long as rails with exceptions not greater than 3 per cent. The grooves, at their intersection in center plate, should be the same depth as the depth of flange in the car wheels, to prevent severe pounding on frog point. A. W. Kennedy, Asst. Eng., United Rys. Co., of St. Louis.

CLOSED CARS FOR GUTHRIE, OKLAHOMA

The American Car Company has recently delivered to the Guthrie Railway Company five closed cars, 20 ft. over the end panels and 7 ft. 5½ ins. over the posts at the belt. The seats are longitudinally placed and are of spring rattan. The illustration shows the stove in the center of the car. Pockets are provided in the side walls into which the windows are arranged to drop. Cherry, with glossed birch ceilings, constitutes the interior finish. The cars are to be run in one direction, and one side of each platform is solidly paneled. The rear platform is of the "Detroit" type, being divided to facilitate ingress and egress, and affording extra standing space when the cars are crowded.

DETROIT PLATFORM SINGLE-TRUCK CAR FOR THE GUTHRIE RAILWAY COMPANY

The cars are mounted on the Brill No. 21-E single trucks, with 8-ft. wheel base and 33-in. wheels. Brill angle-iron bumpers and American Car Company's sand boxes and gongs are included in the furnishings. The length over the crown pieces is 30 ft., and from the panel over the crown piece, 4 ft. at the front and 6 ft. at the rear. The width over the sills, including the plates, is 6 ft. 3 ins. The sweep of the posts is 7 9-16 ins., and the distance between the centers of the posts is 33 13-28 ins. The side sills are 4 ins. x 7 ins., and the end sills, 3¾ ins. x 6 ins.; the thickness of the corner posts, 3¾ ins., and of the side posts, 1¾ ins.

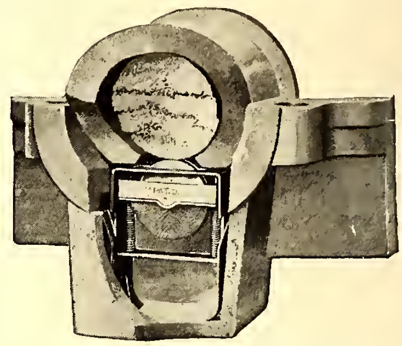


LONGITUDINAL SEATING ARRANGEMENT OF GUTHRIE CAR

The Rapid Transit Commission of New York has decided to investigate the ventilation of the subway. At present the circulation of air between the subway and the street is due to three causes: the movement of trains, forcing it in and out; winds blowing down the hooded stairways, and, finally, the rising of warm air from the subway and the descent of cold air to take its place.

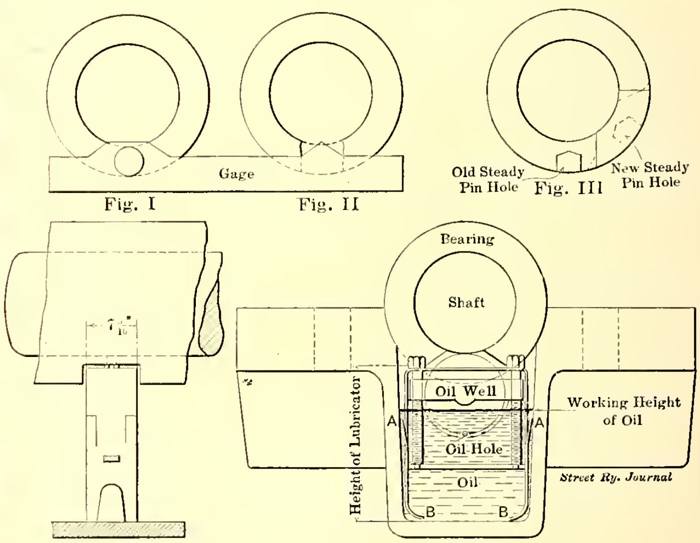
AXLE LUBRICATOR FOR ALL CLASSES OF BEARINGS

The axle lubricator shown in the accompanying illustrations was designed by the Axle Lubricator Company, of Savannah, Ga., as an improvement on the ordinary ring oiler. The lubricator is composed of a frame made of 1-16-in. x 1¼-in. steel, so arranged that it can be adjusted to any slight variations in the size of the oil cellar. The frame has parallel bars extending from the cross-bar near the bottom to the top, which act as guides for an oil well within which a disc is pivoted. This oil well cases away the disc from the oil in the cellar. In the lower portion of this well an opening is provided through which the lubricant passes into the interior of the well and is taken up by the disc to the journal. The flow of oil is governed by the size of this opening, which is sufficiently large not to become clogged, and is at all times below the surface of the oil.



ARRANGEMENT OF LUBRICATOR, WITH REFERENCE TO BEARING

A strainer is located over the lower portion of this well for relieving the lubricant of all foreign matter. The wheel within the well is adapted to bear against the shaft through the opening in the bottom of the bearing, and as the journal revolves, the oil is conveyed by the disc to the bearing. The oil that drips from the bearing back into the original oil cellar may be used again, thus allowing an oil inlet many times larger than could be used by a gravity cup. The oil well containing disc, strainer, etc., is pressed upward with two coil springs located around the parallel bars. These springs are just sufficient to maintain the periphery of the disc in contact with that of the shaft.



ILLUSTRATIONS SHOWING CHANGES IN OIL RECEPTACLE NECESSARY TO ADAPT IT FOR AXLE-LUBRICATING DEVICE

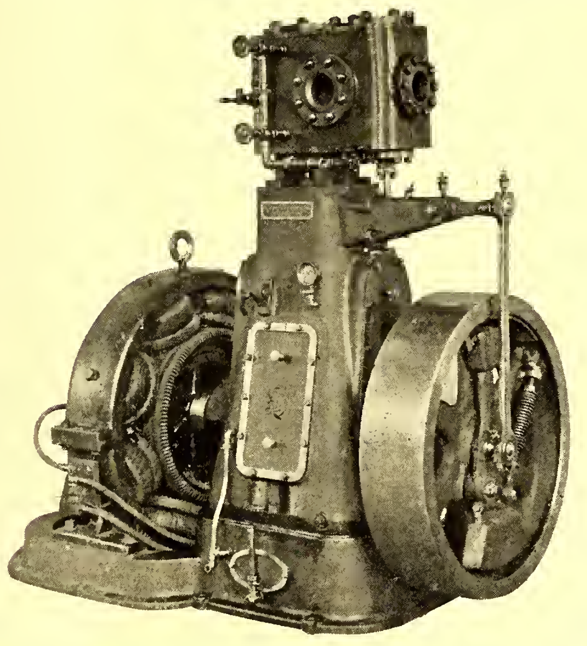
The engravings marked Figs. 1 to 5 are taken from a drawing prepared to show how the oil receptacles of standard motors can be modified to use this device. Fig. 1 shows the bearing ready to install; Fig. 2, the new bearing with small opening before it has been fitted to gage; Fig. 3, the old bearing with the full lines showing the old opening and lug-pin hole, and the dotted lines the amount to be taken out to fit the gage and new lug-pin hole; Fig. 4, the width of the slot in the bearing; Fig. 5, end view of the bearing, cap and lubricator. The parts marked *a* in Fig. 5 should be bent outward to fit the cellar, and those marked *b* show the ends of the frames which should be bent toward the center instead of cut off to obtain the required height.

About ½ gill of oil per day of eighteen hours will keep the bearing thoroughly lubricated using a 1-16-in. oil hole. It is claimed that there is positively no waste with this device, for when the journal stops, the flow of oil must also cease.

A VERTICAL TYPE DIRECT-CONNECTED GENERATING SET

The B. F. Sturtevant Company, of Boston, Mass., has recently designed a 25-kw generating set consisting of a 2-in. x 8-in. single vertical enclosed automatic engine, direct connected with solid sub-base, extended shaft, with through bolted coupling and outboard bearing to a 9-100 M.P. 8 compound-wound generator, operating at a speed of 350 r. p. m., with 90 lbs. steam pressure at the throttle.

The engine cylinder and steam chest are covered with sheet-iron lagging, enclosing a layer of asbestos or magnesia fibre. The cylinder is provided at each end with relief valves of large diameter, adjustable to open automatically at any pressure desired. The piston is cored out and provided with internal ribbing, making it very light and strong. It is of open-hearth steel, running through a deep stuffing box. The rod does not touch the cylinder head, which is bored large, a bronze ring fitting the rod in the bottom of the stuffing box, preventing the escape of the packing to the interior of the cylinder



VERTICAL ENCLOSED ENGINE TO 25-KW DIRECT-CURRENT GENERATOR

The valve is of the balanced-piston type, working in removable bushings and provided with cast-iron packing rings. The guides are cast in one piece with the frame. The cross-head is of cast iron, fitted with adjustable shoes. The connecting rod is of forged steel, provided with removable boxes at each end and lined with babbitt metal hammered in and bored out. The shaft is of open-hearth steel, forged in one piece. Counterweights of cast iron are securely bolted to crank webs.

The valve is connected by a rocker and rod to an eccentric directly attached to an inertia governor of the Rites type. This is placed on the fly-wheel of the engine and automatically regulates the speed within 2 per cent from no load to full load. The cylinder is tapped for indicator gear, which is so arranged that cards may be taken without interfering with the oil tightness of the case. The cylinder is raised from the frame and a stuffing box for the piston rod is fitted in the top. This prevents oil being carried into the cylinder on the rod and cylinder condensation mixing with the oil in the frame. At the same time this arrangement will give ready access to the stuffing boxes while running.

Forced lubrication is used, consisting of an oil pump operated from the main crank shaft, and forcing oil at from 10 lbs. to 20 lbs. pressure into the main bearings, through the crank shaft, web, crank-pin, through the connecting rod to the cross-head pin. Connection is also made from the oil pump to the main cross-head guides. This system serves not only to deliver oil to all bearings, but also to maintain under pressure a film of oil between the two bearing surfaces, thereby greatly reducing the friction and increasing the mechanical efficiency of the engines. The thorough enclosure of the engine prevents all splashing of oil into the engine room.

The field frame of the generator is made of soft, gray cast iron, the pole pieces of wrought iron, and the pole shoes of cast iron. The field coils are made in two sections, the compound winding forming one, and the shunt winding forming the other. They are both made up of the best double cotton-covered wire, thoroughly shellaced, taped, reshellaced and baked before being mounted on the pole pieces. The armature is of the barrel-wound, toothed, hollow drum type.

The spider is made of cast iron with hub extended for supporting the commutator. The armature core is made of annealed soft steel, each sheet being shellaced before being mounted on the spider, to prevent eddy currents, and the core is divided into two or more sections, allowing space for ventilating ducts. All the laminations forming the core are machine slotted before being mounted on the spider. After being mounted on the spider all the armature slots are insulated by means of insulating troughs. The armature winding is of the coil or bar-wound type; if of the former, the coils are formed up of the best double cotton-covered wire, shaped and thoroughly taped before being mounted on the core; if of the latter, they are made of solid copper bars, formed before being mounted on the core, after which they receive several baths of insulated shellac, and are thoroughly baked.

The commutator is made of forged copper, thoroughly insulated by selected amber mica. The brush holder, of which there are two or more in number on each stud, are made of composition throughout, and are of the self-adjusting socket type. On this type the spring is not called upon to carry any current, consequently there is no danger of the spring losing its tension from heating. The brushes are of soft carbon, and of ample cross-section to prevent the current density exceeding 30 amps. per square inch carrying capacity under normal conditions. The brush studs and brushes are all carried on one self-contained rocker arm secured to the field frame, which permits of moving all the brushes simultaneously.

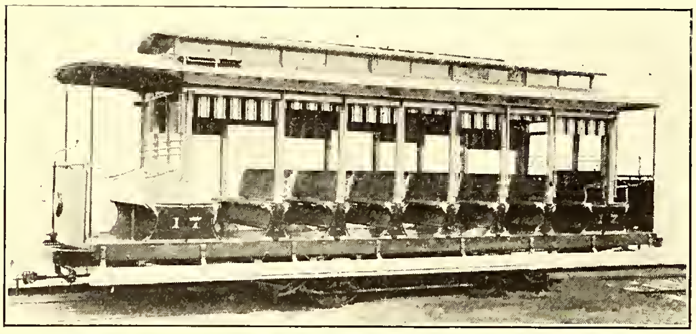
The test for dielectric strength (or breakdown) on these generators is made with a pressure of 1500 volts alternating e.m.f. for a duration of one minute, with a generator having a capacity of 7 kw. The heat rise of the generator will not exceed 40 degs. C. above the surrounding air for a four-hour full-rated load run, and an overload of 25 per cent can be carried for two hours without the temperature rise exceeding 50 degs. C. above the surrounding air. A momentary overload of 100 per cent can be carried without flashing.

The Cleveland & Southwestern Traction Company has instituted limited service between Cleveland and Wooster over its southern division. In addition to regular hourly service, it has two cars each way which stop only in towns, making the 57 miles in two hours and thirty minutes, forty-five minutes faster than the regular schedule. No excess fare is charged, and the cars are securing a lot of business that formerly went to the steam roads in the territory.

OPEN CARS FOR CLINTON, IOWA

Six ten-bench open cars, built by the American Car Company, have recently been placed in operation on the lines of the State Electric Company, Iowa, connecting Clinton and Lyons. These towns are situated in the central western part of Iowa, on the Mississippi River. The lines touch the attractive amusement resort, Joyce Park, which is owned by the company.

The new cars measure 21 ft. 1⅜ ins. over the end panels, and 7 ft. ½ in. over the seat ends. The seating capacity is fifty, and the seats are of the reversible type. The inside finish is of ash, and the ceilings are of birch neatly decorated. The sashes in the bulkheads are arranged to drop into pockets between the seats. The curtains may be pulled down to the floor. The furnishings include Brill angle-iron bumpers, "Dedenda" gongs and brake rigging. The trucks are of the Brill No. 21-E type, with 7-ft. 6-in. wheel base and 33-in. wheels.



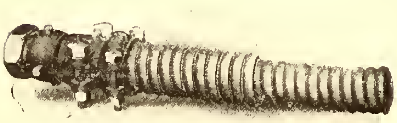
SINGLE-TRUCK OPEN CAR FOR CLINTON, IA.

The length over the crown pieces is 28 ft. 8⅜ ins., and over the sill plates, 6 ft. 3 ins. The sweep of the posts is 5 ins. The distance between the centers of the posts is 2 ft. 8 ins. The side sill size is 3¾ ins. x 7 ins., the sill plates are 7 ins. x ½ in., the thickness of the corner posts is 3⅝ ins., and of the side posts 2¾ ins. The height of the steps is 18⅛ ins., and of the risers 15½ ins.

FLEXIBLE STEEL-ARMORED HOSE

The flexible steel-armored hose, which has recently been placed on the market by the Sprague Electric Company, consists of a rubber hose completely encased in a flexible steel tube, so that no part of the rubber is exposed, even on a bend. Not only is the hose thus thoroughly protected from outside injury, but the steel wrapper binds the rubber so tightly that it prevents expansion, and thereby lessens the strain on the hose from the pressure within. The durability is consequently greatly increased. The reliability of flexible steel-armored hose, however, is a vital consideration. It is said to be absolutely safe, and many trains are now being equipped with it for air brakes, signaling or other work.

VIEW OF ARMOR CONSTRUCTION



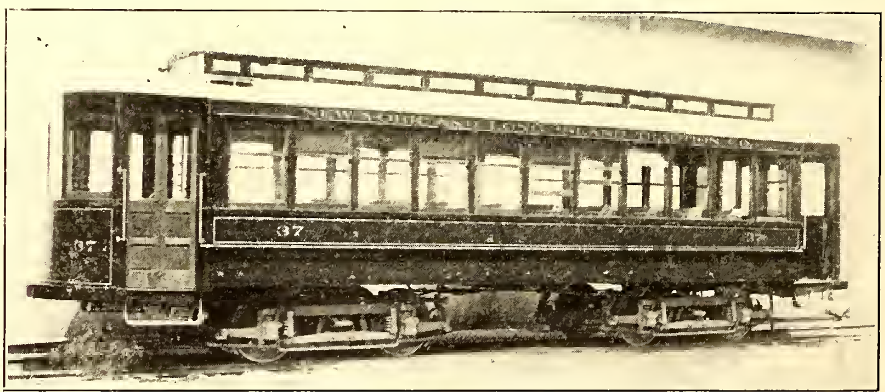
HOSE COUPLING WITH REINFORCING FLEXIBLE BUSHING

Heretofore, the best hose on the market was liable to burst without a moment's warning, and result in heavy damages, due to the non-working of the signals or air brakes, because of a leak in the hose connections, but this flexible steel-armored hose is intended to eliminate such dangers. This fact is said to have been demonstrated in actual service where a train was brought promptly into the station after the hose lining had given out. The steel armor binds the rubber so tightly that even where a rupture occurs in the lining, the loss of power is so slight that it does not interfere with the working efficiency of the hose. After the hose has been damaged it can still be used until it is convenient to replace it with a new piece. The first illustration shows the construction of the armor around the rubber hose, and the second illustrates the re-enforcing bushing which strengthens the terminal joint without interfering with the flexibility of the hose.

SEMI-CONVERTIBLE CARS FOR LONG ISLAND

The J. G. Brill Company has recently delivered to the New York & Long Island Traction Company four semi-convertible cars of the type illustrated. These will be operated on the company's 33 miles of track, connecting Mineola, Garden City, Freeport, Rockville Center, Hempstead, Queens, Lynbrook, Valley Stream and Roosevelt. The large windows, which are opened at the rear, and the low window sills, upon which neat arm-rests are provided, show that the cars have the builder's well-known semi-convertible window system. The cars are mounted on No. 27-A-1 trucks, with 55-hp motors, and will be run on a fast schedule. Forty-two passengers may be comfortably seated, the seats being of spring cane, 37 ins. long, and the aisle 24 ins. wide. Cherry, natural, with birch ceilings, constitutes the interior finish.

The corner posts are 3⅝ ins. thick, and the side posts 3¼ ins. Steel plates, 12 ins. x ⅜ in., take the place of upper and lower trusses, and each side post, besides being deeply tenoned into the side sills, is secured to the plate with two screws, which increases the firmness of the posts. The outside platform knees are re-enforced with angle-iron, while those at the center are composed of angle-iron offset for the purpose, and which extend 4 ft. 5 ins. back of the center of the body bolsters, which is the builder's standard practice, and brings the larger part of the platform load directly to bear upon the bolster, thereby relieving the car body of much of the strain.



ONE OF THE TEN DOUBLE-VESTIBULE CARS FOR THE NEW YORK & LONG ISLAND TRACTION COMPANY

The length over the end panels is 30 ft. 8 ins., and over the crown pieces and the vestibules 40 ft. 8 ins. The width over the sills is 8 ft. 2½ ins., and over the posts at the belt 8 ft. 6 ins. The sweep of the posts is 1¾ ins. The distance between the centers of the posts is 2 ft. 8 ins. The side sill size is 4 ins. x 7¾ ins., and the end sill size 5½ ins. x 6⅞ ins.

LEGAL DEPARTMENT*

CHARTERS, ORDINANCES, FRANCHISES, ETC.

CALIFORNIA.—Courts—Jurisdiction of Circuit Court—Case Arising Under Federal Constitution—Street Railways—Award of Franchise to Next Highest Bidder when Successful Bidder Defaults.

1. A substantial controversy respecting rights under the Federal Constitution, presented by the averments of the bill, is sufficient to support the jurisdiction of a Federal Circuit Court, irrespective of the actual sufficiency of the facts alleged to justify the relief sought, or of the facts as they may subsequently turn out.

2. The acceptance of a bid already made when the successful bidder defaults is necessitated by the provision of Cal. act March 11, 1901, Sec. 5, for the granting of a street railway franchise by a municipality to the "next highest bidder" therefor, in case the successful bidder fails to make the requisite deposit of the amount of his bid within twenty-four hours after the sale.—(Pacific Electric Ry. Co., Appt., vs. City of Los Angeles, P. W. Powers, W. H. Pierce, et al., etc., 24 Sup. Rep., 586.)

ILLINOIS. — Municipal Corporations — Public Improvements — Resolutions—Engineer's Estimate—Statutes—Construction—Actions—Subject Matter—Jurisdiction—Objections—General Appearance—Waiver—New Trial—Grounds—Objections on Appeal.

Where no rule is entered or applied for to compel a party moving for a new trial to file a written motion stating the grounds relied on, and no objection is taken in the trial court that the reasons for the new trial were not stated in writing, such objection cannot be urged on appeal.

2. Where an objection to a judgment confirming a special assessment for street paving was one which challenged the jurisdiction of the court over the subject matter, such objection was not waived by a general appearance.

3. A first resolution for a street improvement reciting that the improvement was thereby originated, the estimate of the cost being $17,000, "which estimate is hereby referred to and made a part of this resolution by reference," but which estimate was not transcribed on any record of the board whatsoever, did not comply with Local Improvement Act 1897, Sec. 7 (Hurd's Rev. St. 1899, c. 24, Sec. 513), requiring that the estimate of the cost of the proposed improvement "shall be made a part of the record of the first resolution."

4. The fact that the engineer's estimate, together with all similar estimates, were kept on file in the office of the board of local improvements, were properly indexed, open, and immediately accessible to any person, did not constitute a substantial compliance with such section.

5. Since Local Improvement Act 1897, Sec. 7 (Hurd's Rev. St. 1899, c. 24, Sec. 513), requiring the estimate of the cost of a proposed improvement to be made a part of the record of the first resolution authorizing the same, applies to the entire State, a construction of such statute by the board of local improvements of a city, different from the legal construction thereof, could not be adopted.—Chicago Union Traction Co. vs. City of Chicago, 70 N. E. Rep., 659.)

KENTUCKY.—Obstruction of Street Railroad Viaduct—Injury to Abutting Owner—Suit for Injunction—Dissolution—Amendment of Petition—Suit for Damages—Instructions—Verdict—Excessive Damages.

1. Where, in a suit by the owner of property abutting on a street for an injunction restraining the erection of a railroad viaduct in the street, it appeared that she was entitled to damages if the allegations of the petition were true, it was not error after the dissolution of the injunction to permit plaintiff to amend her petition so as to pray for the recovery of damages.

2. Where a railroad viaduct 10 ft. or 12 ft. high was erected in the central part of a street, leaving only the space of 21 ft. between the viaduct and the property line of an abutting owner and 11 ft. between the viaduct and sidewalk, he was entitled to damages for depreciation of value owing to the obstruction of ingress or egress.

3. Where, in an action by the owner of property abutting on a street for damages owing to the obstruction of ingress and egress by the erection of a railroad viaduct in the street, the court plainly told the jury in three succeeding instructions that they could give plaintiff damages only for the obstruction of ingress and egress, a fourth instruction that the jury should ascertain the market value of the property just before it became known that the viaduct was to be built, and then ascertain what portion of that value had been taken from that property by the viaduct, and that such amount would be the damages, was not erroneous on the theory that it allowed the jury to find for plaintiff for depreciation of value not due to obstruction of ingress and egress.

4. In an action by the owner of property abutting on a street for damages by the erection of a railroad viaduct in the street, plaintiff's evidence having tended to show that her property was worth about $1,250 before the construction of the viaduct, and that it had been damaged in the sum of $625, and it appearing that the space between the sidewalk and the viaduct was only 11 ft. in front of the property, and that the same had been seriously impaired, a verdict for $425 was not excessive.—(Camden Interstate Ry. Co. vs. Smiley, 84 S. W. Rep., 523.)

NEW JERSEY.—Eminent Domain—Procedure—Appeal—Review by Justice of Supreme Court.

The review, before a justice of the Supreme Court, of the award made by commissioners for land required, under the provisions of the traction companies' act of 1893 (Gen. St., p. 3235), is "an appeal" within the meaning of Section 9 of the eminent domain act of 1900 (P. L., p. 79), for which the appeal provided by the later act is substituted.—(Van Emburgh vs. Paterson & State Line Traction Co., 59 Atl. Rep., 461.)

NEW YORK.—Street Railways—Transfers—Refusal of Transfers—Evidence—Excuses—Failure to Have Transfers—Misbehavior of Passenger.

1. In an action against a street railway to recover a penalty, evidence held to show that the refusal of defendant's conductor to furnish plaintiff with a transfer ticket was willful.

2. The mere fact that a street railway conductor did not have the usual transfer tickets when requested to give them to a passenger, did not absolve the street railway from the statutory duty of furnishing transfer tickets.

3. The fact that boys riding on a street car indulged in "skylarking" did not affect their standing as passengers, or their right to have transfer tickets furnished them by the conductor.—(Rosenberg vs. Brooklyn Heights R. Co. (two cases). Ehrlich vs. Same. Beck vs. Same. Silverman vs. Same. Shargin vs. Same, 86 N. Y. Sup., 871.)

NEW YORK.—Carriers—Street Car Passenger—Ejection—Refusal to Pay Fare.

A street car passenger who, on being refused a transfer, instead of leaving the car, continues thereon to the end of the line, and refuses, on the car's return trip, to pay an additional fare, whereupon he is forcibly ejected, has no cause of action against the company.—(Hoelljes vs. Interurban St. Ry. Co., 87 N. Y. Sup., 133.)

NEW YORK.—Street Railways—Transfers—Refusal to Accept—Statutory Provisions—Action to Recover Penalty—Construction—Evidence—Presumptions.

1. Under Laws 1892, p. 1406, c. 676, Sec. 104, requiring a street railway to give to each passenger paying a single fare a transfer, etc., a refusal to accept a valid transfer tendered by a passenger is equivalent to a refusal to give one, rendering defendant liable to the penalty provided.

2. In an action to recover the penalty imposed by Laws 1892, p. 1406, c. 676, Sec. 104, on a street railway refusing to give a transfer to a passenger, where there are two lines of cars, one of which is operated by defendant, running along a street, it will not be presumed, in the absence of proof, that the car boarded by plaintiff, and on which a transfer tendered by him was refused, ran over the line operated by defendant.—(Harris vs. Interurban St. Ry. Co. Linter vs. Same, 92 N. Y. Sup., 42.)

NEW YORK.—Carriers—Street Railways—Transfers.

1. Where, though a passenger knew he could have traveled to his destination by pursuing a route over which defendant street railway company issued transfers, he had frequently traveled over the route selected, and had always theretofore been given a transfer, and there was no evidence that any notice of the discontinuance of transfers was given to him when he boarded the car, or until no alternative continuous route was available, defendant was liable for refusal to issue a transfer to him as theretofore.—Freeman vs. New York City Ry. Co., 92 N. Y. Sup., 47.)

NEW YORK.—Street Railroads—Transfers—Penalty for Refusal—Same.

1. In an action for the penalty under the statute requiring street railways to give transfers at intersecting points, an answer pleading a possible alternative route, but without alleging that transfer was issued on such alternative route, is insufficient.

2. Where it is not alleged or shown by defendant that the plaintiff was actually notified before he began his journey, or that means were adopted to give him notice that a transfer would not be given on a particular intersecting route, but would be given on another equally available, the defendant is liable.—(Holmes vs. Interurban St. Ry. Co., 92 N. Y. Sup., 57.)

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* Conducted by Wilbur Larremore, of the New York Bar, 32 Nassau Street, New York, to whom all correspondence concerning this department should be addressed.

NEW YORK.—Street Railroads—Refusal of Transfer—Excuse.

Under Railroad Law (Laws 1892, p. 1406, c. 676), Sec. 104, requiring certain street railroads to give to each passenger, on demand, without extra charge, a transfer entitling the passenger to one continuous trip to any point or portion of such railroad, it is no excuse for the refusal to give a transfer at a particular point that it might cause undue crowding in the street and at the crossings.—(Moskowitz vs. Brooklyn Heights R. Co., 93 N. Y. Sup., 386.)

NEW YORK.—Street Railways—Refusal to Transfer—Statutory Penalty—Cumulative Penalties.

1. Defendant operated two intersecting street car lines within the limits of New York City. Plaintiff, a passenger on one of these lines, demanded a transfer, which the conductor refused to issue. Plaintiff, after repeating his demand, left the car, boarded an intersecting car, and explained the situation to the conductor on that car. The latter conductor refused to carry plaintiff unless he paid an extra fare, which he did. Held, that plaintiff was entitled to the penalty prescribed by Railroad Law, Sec. 104 (Heydecker's Gen. Laws, p. 3320, c. 39), for the refusal of a street railroad to issue a continuous trip transfer to a passenger.

2. The penalties prescribed by Railroad Law, Sec. 104 (Heydecker's Gen. Laws, p. 3320, c. 39), for the refusal by a street railroad of a transfer to a passenger, are not cumulative, but only one penalty can be recovered in a single action, and the commencement of such action is a waiver of all penalties previously incurred.—(McLean vs. Interurban St. Ry. Co., 92 N. Y. Sup., 77.)

NEW YORK.—Carriers—Street Railroads—Passengers—Transfers—Penalties—Cumulation—Amendment.

1. Penalties imposed by Railroad Law (Laws 1892, p. 1406, c. 676) Sec. 104, against street railway corporations for refusing to issue transfers entitling a passenger to one continuous trip to any point on any railroad embraced in a consolidation contract, etc., may be cumulated.

2. Railroad Law (Laws 1890, p. 1082, c. 565, as amended by Laws 1892, p. 1382, c. 676) provides for the joint operation of street railroads, and section 104 (page 1406) declares that every such corporation entering into such contract shall carry or permit to be carried on roads embraced in the contract any passenger for a continuous trip for a single fare, and also requires the issuance of transfers. Held, that such section was not limited to traffic contracts, but embraced leases as well.

3. Laws 1885, p. 525, c. 305, authorizing traffic contracts between street railway companies, declares (section 4) that every company entering into any contract under the act shall carry or permit any other party to such contract to carry between any two points on the railroad embraced in such contract any passenger desiring to make one continuous trip between the points, for a single fare, and shall issue transfers, and declares that for every refusal to comply therewith the corporation shall forfeit to the party aggrieved the sum of $50. Such act was repealed by Laws of 1892, pp. 1813, 1814, c. 687, Sec. 34, but section 36 thereof declared that the provisions of such chapter, of the stock corporation law, the railroad law, etc., so far as they were substantially the same as the laws existing in 1891, should be construed as a continuance of such laws, modified or amended according to the language employed in the chapter or in the stock corporation law, the railroad law, etc., and not as new enactments. Held, that since Laws 1885, p. 525, c. 305, Sec. 4, was exactly similar to Railroad Law (Laws 1892, p. 1406, c. 676) Sec. 104, the repeal of section 4 did not operate to relieve railroad companies having taken advantage thereof from the obligations thereby assumed.—(Lux vs. New York City Ry. Co., 92 N. Y. Sup., 109.)

NEW YORK.—Highways—Ownership of Fee—Deed—Presumptions—Street Railways—Consent to Construction—Abandonment of Use—Revocation of Consent.

1. Where the court, on the evidence, finds that a street was not a public highway, prior to 1664, at the time of the capitulation by the Dutch to the English, it is a finding that the Dutch law, which placed the title of the street in the public and not in the abutting owner, does not apply to such street.

2. Where a city conveyed land, describing it as abutting on a public street, the deed is presumed to carry title to the center of the street, subject to the right of way over it, where there was no reservation of title to the center of the street.

3. Where owners of the fee of the street on which their lots abut, have consented to the construction and operation of a street railway over the highway, they cannot withdraw such consent where there is no contract with the company giving them such right, without the consent of the State and the general public and the stockholders of the company; and an act by the receiver of the company, appointed in foreclosure, under an order limiting his authority to the management and protection of the property, in abandoning the use of such highway, does not destroy the rights acquired by the company under such consents, so as to entitle the consenting owners to an injunction restraining the subsequent operation of the road on the ground that the rights acquired by the street railway have been abandoned by the receiver.

4. Where a street railway company had obtained the consent of abutting owners to construction of its road in a highway, and thereafter a receiver appointed in foreclosure to manage the road abandoned that portion of the highway to which the consents attached, the fact that the company succeeding to its rights by purchase attempted to obtain the consent of the abutting owners to the reconstruction of that part of the railway abandoned by the receiver in no way impaired its rights under the original consent, and a proceeding to obtain the approval of its road, though unnecessary, was not destructive of such rights.

5. Where abutting owners consented to the building of a street railway on a highway, and thereafter a strip of land outside of the original street was acquired by the city under condemnation proceedings, an abutting owner who owned the fee to the center still held the fee to the land lying between the center of the street and the former boundary, and, where he did not consent to the construction of the railway over the premises, he is entitled to restrain the use by the railway of such strip.—(Paige vs. Schenectady Ry. Co.,; Lansing vs. Same; Van Epps vs. Same; Beattie vs. Same; Thompson vs. Same; Whitmyre vs. Same, 70 N. E. Rep., 213.)

NEW YORK.—Street Railways—Refusal to Give Transfer—Penalty.

Recovery of the penalty provided by Laws 1890, p. 1114, c. 565, Sec. 104, for refusal to give a transfer to "any passenger desiring to make a continuous trip," may be had by one riding for the purpose of recovering penalties for the refusal.—(McLean vs. Interurban St. Ry. Co., 87 N. Y. Sup., 136.)

NEW YORK.—Taxation—Review of Commissioners' Action—Certiorari—Nature of Proceedings—Corporations—Taxation—Assessment—Capital Stock—Franchise—Taxation—Statement of Commissioners—Failure to Take Testimony—Effect—Review of Commissioners' Action—Party Aggrieved.

1. In certiorari to review the proceedings of the commissioners of assessment, the court, when the proceedings came on for trial, decided that testimony was necessary, and appointed a referee to take the same and report. On the hearing before the referee the relator produced no testimony, but rested its case on the return of the assessors to the writ, and thereafter the court confirmed the report of the referee and cancelled the tax. Held, that the court, by deciding in the first instance that testimony was necessary, was not precluded from determining that the tax was illegal on the face of the return.

2. A corporation is entitled, on an assessment for taxation, to have deducted from its personal property the amount of its debts.

3. "Capital stock," as used in the tax law, does not mean share stock, but means the actual money or property paid in and possessed by the corporation.

4. The assessors have no jurisdiction to determine the assessable value of the franchise of a corporation.

5. While the commissioners of assessment have power to examine the officers of a corporation under oath, and to require a fuller statement of its property, where it receives a corporation's statement and makes no further inquiries, the board is not at liberty to disregard the facts contained in the statement.

6. Where in certiorari, on relation of a corporation, to review the proceedings of the commissioners of assessment in assessing relator for taxation, the statement filed by the corporation with the commissioners, and on which their action was based, shows that the corporation had no personalty subject to taxes, it sufficiently appears that the corporation was "aggrieved," so as to entitle it to a cancellation of the tax.

Van Brunt, P. J., dissenting in part.—(People ex rel. Twenty-Third St. Ry. Co. vs. Feitner et al., Com'rs., 87 N. Y. Sup., 305.)

NEW YORK.—Railroads—Construction—Certificate of Necessity—Protest of Property Owners.

The certificate of public necessity and convenience required by section 59 of the railroad law, as amended by Laws 1895, p. 317, c. 545, as a condition precedent to the construction of a railroad, should not be granted by the Railroad Commissioners to a company desiring to construct a freight switch road along a valuable water front, which has not been developed, and which, in its present condition, needs no freight facilities, as the land fronting thereon is unimproved agricultural land, on which no manufactories have been established, where over 60 per cent of the owners of the land and proprietors of the water frontage oppose the construction of the road.—(People ex rel. Amm et al. vs. State Board of Railroad Com'rs. et al., 93 N. Y. Sup., 58.)

NEW YORK.—Adverse Possession—Incorporeal Rights—Admission that Possession is not Adverse.

1. A street railway company entered upon a street by consent of the municipal authorities, expressly claiming that its occupation was

limited to the public right in the street, and that it did not invade any property right possessed by abutting owners. Afterward a case was decided which held that the occupation of the street by the railway company was in fact in interference with the abutting owners' easements of light, air and access. Held that limitations did not begin to run against the right of an abutting owner to sue for the injury to his incorporeal rights until the determination that the company was interfering with such rights.

2. Where a street railway company which occupied a street so as to interfere with the abutting owners' easements of light, air and access, made compensation to some owners for such interference, it thereby admitted that its use of the easements was not hostile and adverse as to any of the owners.—(Hindley vs. Manhattan Ry. Co. et al., 93 N. Y. Sup., 53.)

NEW YORK.—Street Railroads—Construction—Authorization by Court—Conditions—Payment of Damages.

Const. Art. 3, Sec. 18, prohibits the construction of a street railroad except upon the consent of one-half of the property owners affected thereby, or, in case such consent cannot be obtained, upon the confirmation by the Appellate Division of a commissioners' report determining that the railroad should be constructed. Laws 1891, p. 5, c. 4, Sec. 5, prescribes an appropriate procedure in accordance with the constitutional provision. An underground railroad procured an order of the Appellate Division confirming the report of commissioners in favor of the construction of the railroad according to certain plans. Subsequently, without either the consent of property owners or an order of court, the railroad made substantial modifications in its plans, and completed its road according to such unauthorized modification. This construction materially damaged abutting property, but the road, as a whole, would be, in its operation, beneficial to the city. Held that the Appellate Division had power to, and would as a condition of confirming a report of commissioners sanctioning the maintenance and operation of the railroad according to the modified plan, require the railroad to pay the property owners the amount of the damage done to them by the unauthorized construction of the road. Van Brunt, P. J., dissenting.—(In re Board of Rapid Transit Railroad Com'rs of City of New York, 93 N. Y. Sup., 930.)

NEW YORK.—Street Railroads—Liability for Paving Streets.

In granting a street railroad company a permit to lay its tracks on a street, the city fixed as a condition that the company should replace the pavement in accordance with the specifications in use by the department of public works, and to renew the pavement as required by the commissioners, supplying trap block pavement at its own cost between the rails and for a certain distance outside the tracks, and that, if the company should refuse or neglect to do the work on notice, then the city might do the same at the cost of the company. The company accepted the terms of the permit by laying its tracks in the street. Afterward the City Council resolved that the street "be paved with granite blocks," and the company was notified of this resolution, and that, if it failed to thus pave the street, the city would do so at the company's expense. Held that the city having paved the street, and the company having failed to pave its portion thereof, the company was liable to the extent of what it would have cost to so pave it with trap block pavement.—(Mayor, etc., of City of New York vs. Harlem Bridge, M. & F. Ry. Co., 91 N. Y. Sup., 557.)

NEW YORK.—Street Railroads—Change of Line—Abandonment—Abandonment of Line.

1. The action of the Forty-Second Street Railroad Company in constructing its road on the Boulevard in New York City under Laws 1884, p. 309, c. 252, did not amount to an abandonment of the Amsterdam Avenue route.

2. The fact that the Forty-Second Street Railroad Company during a portion of the year 1902 and up to April 16, 1903, operated only one car a day over its tracks on Amsterdam Avenue, and that there were days in times of snowfall when no car was operated, did not show an abandonment of the route, so as to give the city the right to remove the tracks.—(Forty-Second St., M. & St. N. Ave. R. Co. vs. Cantor, President, et al., 93 N. Y. Sup., 944.)

NEW YORK.—Street Railroads—Passenger Paying Fare—Transfers.

Railroad Act, Sec. 104 (Laws 1892, p. 1406, c. 676), provides that street car companies shall upon demand, and without extra charge, give to each passenger paying one single fare a transfer, etc., and that on refusal the company so refusing shall forfeit $50 to the aggrieved party. Held that, where plaintiff's husband paid the fares of both plaintiff and himself on defendant's street car, plaintiff was entitled to a transfer as a "passenger paying one single fare," and on refusal of such transfer could, as the "aggrieved party," maintain an action under the statute.—(Carpenter vs. New York City Ry. Co., 93 N. Y. Sup., 600.)

NEW YORK.—Carriers—Street Railroads—Passengers— Ejection.

Where defendant street railway company was legally bound to issue a transfer to plaintiff at a certain point, and its conductor in fact issued such transfer, it was not entitled to defend an action for wrongful ejection because of plaintiff's refusal to pay fare except by the surrender of such transfer on the ground that it did not issue transfers at such point.

Blanchard, J., dissenting.—(Chiert vs. Interurban St. Ry. Co., 92 N. Y. Sup., 782.)

OHIO.—Constitutional Law—Impairment of Obligations of Contract—Street Railway Franchises.

By a city ordinance, duly passed under legislative authority, two separate railroad companies, theretofore operating independent lines, were authorized to consolidate, subject to the conditions therein imposed, which required the consolidated company to run through cars, and to carry passengers between any two points on the consolidated lines for a single fare. The franchise of one of the constituent companies expired by its terms in 1904, and that of the other in 1908. By a subsequent ordinance the consolidated company was authorized to use electric power on all of its lines, and by others to build and operate various extensions in connection with its main line; such extension ordinances severally providing that "the right herein granted shall terminate with the present grant of the main line, to wit, on the 10th day of February, 1908." All of such ordinances were required to be, and were, accepted by the company and complied with. Held that they created contracts which bound the company to operate all of its lines as a unitary system until February, 1908, and conferred upon it the corresponding right to do so, and that an ordinance passed in 1904 granting a renewal of the franchise of the constituent company, which expired in that year, to a new company, to the exclusion of the consolidated company, was unconstitutional and void, as impairing the obligation of such contracts.—(Cleveland Electric Ry. Co. vs. City of Cleveland et al., 135 Fed. Rep., 368.)

PENNSYLVANIA.—Taxations—Exemptions—Power House.

Under Act April 21, 1858 (P. L. 385), providing that real property of railroad corporations—the superstructure of the road and water stations alone excepted—shall be subject to taxation for city purposes, a power house for the manufacture of electricity, owned and used by a traction motor company operating street railways, is exempt from taxation.—(City of Philadelphia vs. Electric Traction Co., 57 Atl. Rep., 354.)

TENNESSEE.—Municipal Corporations—Railroads—Occupation of Street—Interference with Public Travel—Damage to Abutting Property—Injunction.

1. A railroad company, incorporated under the general incorporation act of 1875 (Acts 1875, p. 232, c. 142), has a right to construct its road on the streets of an incorporated city when authorized so to do by the proper municipal authorities.

2. A city cannot consent to the use of a street for railroad tracks in such a manner as to seriously interfere with the right of the public to use the street for ordinary purposes of travel.

3. An owner of property abutting on a street is entitled to an injunction to prevent the laying of railroad tracks in the street in such a manner as to interfere with his right of ingress and egress and inflict upon him a special injury, distinct from that suffered by the general public, and for which he cannot obtain compensation at law.

4. Plaintiffs owned two large manufacturing establishments fronting on a street 41 ft. wide, through which the materials used and products manufactured by plaintiffs were hauled. The business of plaintiffs required the use of many large wagons and drays, and the street was extensively used. It contained two railroad tracks, one of which was constantly more or less occupied by cars, and the other used by passing trains running every hour of the day. Held that the building of a third track in the street would subject plaintiffs to such peculiar and irreparable damage that they were entitled to an injunction to prevent it.—(Tennessee Brewing Co. vs. Union Ry. Co., Pepper et al. vs. Same, 85 S. W. Rep., 864.)

VIRGINIA.—Street Railroads—Franchise—Transfers—Intersecting Lines—Line Partially Owned by Different Company.

1. Where the ordinance granting a franchise to a street railroad company imposed certain conditions as to rates of fare and giving of transfers, and the company operated its lines in accordance with these regulations, it thereby assumed contractual obligations with respect to such regulations.

2. The ordinance granting a franchise to a street railroad company provided that it should sell half-fare tickets between certain hours, and give transfers at points where one line intersected with another. The company owned a line which extended from its point of intersection with another line to the city limits, beyond which it was owned by a different corporation, which, however, ran its cars with the same operatives into the city and to the point of intersection. Held, that this line was an intersecting line, to which the provisions as to half-fare tickets and transfers applied.—

(Virginia Passenger & Power Co. et al. vs. Commonwealth, 49 S. E. Rep., 995.)

VIRGINIA.—Eminent Domain—Railroads—Right of Way—Condemnation—Continuance—Damages—Elements.

1. Code 1887, Secs. 1075, 1076, 1079, provide for the condemnation of a railroad right of way; and Sec. 1081 declares that no order or injunction shall be awarded to stay the prosecution of the work, unless the company is transcending its authority, or such injunction is required to prevent injury which cannot be adequately compensated in damages; and Sec. 1084 provides for a proceeding to ascertain what persons are entitled to the fund awarded for land taken, and in what proportions. Held that, under such sections, alleged owners of land sought to be condemned for a railroad right of way were not entitled to have the proceedings stayed pending a suit in equity between such alleged owners, involving the title to the land.

2. Under Code 1887, Sec. 1079, providing that the report of commissioners in railroad condemnation proceedings shall be confirmed, unless good cause is shown to the contrary, and that the amount awarded may be paid into court, or to the persons entitled thereto, the amount awarded to landowners by such report is to be treated as prima facie correct.

3. In a proceeding to condemn land for a railroad right of way, the fact that the land was available for a public park, and that the owners intended to improve the same for that purpose in the future, and use it as a source of revenue in connection with an electric railway, was too speculative, remote and conjectural to be considered as an element of damage.—(Richmond & P. Electric Ry. Co. vs. Seaboard Air Line Ry., 149 S. E. Rep., 512.)

WEST VIRGINIA.—Damages—Breach of Contract—Recoupment for Delay in Performance—Error—Review—Action Tried to Court.

1. Plaintiff, having contracted to build two bridges for defendant, failed to complete the same by the dates specified in the contract. The bridges were required to connect extensions of certain lines of electric railway owned by defendant, which were to be consolidated and operated as a single system, of which purpose plaintiff was advised. Defendant entered upon the construction of its extensions, which could have been completed by the time the last bridge was to be finished, but were not, because it became apparent that the bridge would not then be ready. Held that the measure of the damages defendant was entitled to recover for breach of the contract by way of recoupment against the contract price was the interest at the legal rate on the money expended by it upon the improvements and extensions which were reasonably within the view of the parties when the contracts were made from the date when the last bridge should have been completed, or from the times thereafter when such expenditures were made to the date of its completion.

2. Where a jury is waived by stipulation in an action at law in a Federal Court, its findings of fact are conclusive in the Appellate Court, and only the question of law applicable thereto can be considered.—(American Bridge Co. of New York vs. Camden Inter-State Ry. Co., 135 Fed. Rep., 323.)

LIABILITY FOR NEGLIGENCE

INDIANA.—Street Railroads—Crossing Accident—Personal Injuries—Contributory Negligence—Question for Jury—Instructions—Appeal.

1. In an action against a street railroad for injuries received in a crossing accident, evidence examined, and whether plaintiff was guilty of contributory negligence, held a question for the jury.

2. In such case a charge that in determining the question whether the car was run at a dangerous and unsafe rate of speed the jury "should" take into consideration the time, location and conditions surrounding the accident is not an invasion of the province of the jury.

3. A charge that a car may be run at a higher rate of speed in the suburbs or sparsely settled parts of the city than it may be in the thickly settled, populous, or crowded portion thereof was the statement of a fact which it was the province of the jury to determine.

4. Where the evidence and the answers to interrogatories returned with the general verdict showed that the defendant was negligent in the operation of the car, the fact that an instruction, the body of which contained a correct statement of the law, erroneously stated that a car might be run at a higher rate of speed in the suburbs or sparsely settled parts of the city than in the populous or crowded portion thereof, was not cause for reversal.—(Indianapolis St. Ry. Co. vs. O'Donnell (No. 4878), 73 N. E. Rep., 163.

KENTUCKY.—Street Railroads—Right to Use Tracks—Collision with Vehicles—Negligence—Contributory Negligence—Instructions.

1. Operators of electric street cars must exercise ordinary care commensurate with the circumstances, and must keep a lookout ahead of the car, when in a crowded highway, to secure the safety of others using the highway; and while such cars are entitled to the use of their tracks without obstruction, they can no more run down another vehicle by negligence than any other traveler on the highway may do so, although such vehicle may be upon the tracks.

2. While one driving on a street car track cannot recover for the consequences of a collision, when his presence on the track could not be discovered by the carmen, in the exercise of ordinary care, in time to avert the collision, yet such a one is not a trespasser on the track, and may anticipate that a proper lookout will be kept by the carmen, and that ordinary care will be exercised to avoid running into him.

3. In an action against a street railway for injuries to a driver of a vehicle, a charge that defendant had the superior, but not the exclusive, right to the use of its tracks, and that plaintiff should have used reasonable diligence to keep out of the way of defendant's cars, was misleading, and in lieu thereof the court should have charged that plaintiff was lawfully upon the street, and had the right to use any part of it; that defendant was entitled to the use of its tracks for the free passage of its cars; that it was the duty of those in charge of defendant's cars to keep a lookout for persons and vehicles upon the track, and to exercise ordinary care to discover and avoid injuring them, and that it was the duty of plaintiff in using the street to exercise ordinary care for his own safety.

4. When the court in its charge used the terms "ordinary care," "reasonable diligence," and "reasonable care," it should, in an instruction defining ordinary care, have also told the jury that reasonable diligence or reasonable care is ordinary care.

5. Where the court charged to find for defendant unless defendant could have discovered plaintiff's peril in time to have avoided the injury, a further charge to find for defendant if the motorman exercised ordinary diligence to prevent a collision after he had discovered, or should have discovered, plaintiff's vehicle, was unnecessary, and should have been omitted.

6. In an action against a street railroad for injuries to one driving a vehicle, a charge to find for defendant if the motorman exercised ordinary diligence to prevent the collision after he should have discovered such vehicle on the track was an improper limitation on a previous charge to find for plaintiff if he was injured in the manner complained of in his petition, and such injury was caused by defendant's failure to exercise reasonable care, where there was evidence of other grounds of negligence than that stated in the limiting charge.—(Greene vs. Louisville Ry. Co., 84 S. W. Rep., 1154.)

MARYLAND.—Street Railroads—Death to Passenger—Negligence—Presumptions—Directing Verdict.

1. The mere fact that a passenger on a street car was injured does not of itself raise a presumption of negligence on the part of the carrier.

2. Plaintiff's decedent was thrown from the rear platform of a street car and killed as the car entered and passed over a switch. There was evidence that the car was "going at a good rate of speed," but there was no evidence of negligence on the part of defendant or its employees. Held, that directing a verdict for defendant was proper.—(State, to Use of Charles, vs. United Rys. & Electric Co., 60 Atl. Rep., 249.)

MICHIGAN.—Street Railways—Right to Use Tracks—Rights of Travelers—Negligence of Motorman—Contributory Negligence—Duty to Look Out—Questions for Jury.

1. A motorman who was running his car, on a dark night, about twice as fast as he should have run it to enable him to control the car so as to prevent an accident, and who relied solely upon his gong to warn travelers upon the track of the approach of the car, was negligent.

2. Ordinary travelers have the right to use every part of the highway, including the space between the rails of a street car line, until it becomes necessary for them to yield that space to its cars.

3. It is the duty of one driving upon a street railway track to maintain such a reasonable watchfulness for the approach of a car as, under the circumstances of the particular case, an ordinarily prudent man would do; but he may rely to some extent upon the exercise of proper caution on the part of motormen in controlling their cars, and giving notice of their approach, and need not be constantly looking back, nor take into consideration the fact that a car following him may be running at a reckless rate of speed.

4. It is not negligence per se for one to drive along the track of a street railroad in the night-time, although the street is of sufficient width to permit him to drive off the track, where cars cannot strike him.

5. In an action against a street railway for injuries to one driving a van on the tracks, caused by a collision with a car approaching him from the rear, whether plaintiff was guilty of contributory

negligence held, under the evidence, a question for the jury.—(Ablard vs. Detroit United Ry., 102 N. W. Rep., 741.

MISSOURI.—Street Railroads—Personal Injuries—Collision with Vehicle—Evidence—Question for Jury—Instructions—Contributory Negligence.

1. In an action against a street railroad company for injuries caused by plaintiff's wagon being struck by a car while plaintiff, who was driving parallel with the tracks, was attempting to cross, evidence held to justify submission of the issues of defendant's negligence and plaintiff's contributory negligence.

2. A requested instruction that, if the negligence of plaintiff contributed directly to his injury, the finding should be for defendant, though it was also negligent, was sufficiently embodied in instructions that it was plaintiff's duty before driving on defendant's track to look and listen for cars, and that, if by so doing he could have averted the injury, defendant was not liable, and that the burden was on plaintiff to show that the injuries were caused solely by defendant's negligence, so that, if the injuries were caused by plaintiff driving in front of defendant's car, so that the motorman could not, by the use of ordinary care, stop it in time to avoid collision, defendant was not liable.—(Freymark vs. St. Louis Transit Co., 85 S. W. Rep., 606.)

MISSOURI.—Injuries to Passenger—Sufficiency of Petition—Negligence—Burden of Proof—Damages—Sufficiency of Evidence.

1. In an action for personal injuries, under an allegation that plaintiff "was greatly injured in body and mind and suffered great permanent injury," evidence of particular injuries received by plaintiff may be shown when objections to the petition are made for the first time on the trial.

2. In an action for injuries to a passenger in a collision of defendant's cars, were defendant admits the relation of carrier and passenger between the parties and the fact of the collision, it assumes the burden of disproving negligence.

3. Under an allegation that plaintiff "during all said time has been absolutely unable to perform any labor, and is disqualified from performing his ordinary avocations of life" plaintiff may show his occupation and his loss of time and earnings.

4. In an action for personal injuries plaintiff may recover for physician's services, though the bills for such services have not yet been paid.

5. In an action for personal injuries, evidence considered, and held insufficient to show that plaintiff's injuries are of a permanent character.—(Wilbur vs. Southwest Missouri Electric Ry. Co., 85 S. W. Rep., 671.)

NEW YORK.—Street Railway—Crossings—Damage to Vehicle—Rules of the Road—Witnesses—Cross-Examination—Interest.

1. In an action against a street railway company for damage done to plaintiff's vehicle by collision at a crossing, it was error to exclude the ordinance entitled "Rules of the Road," providing that all vehicles going in a northerly or southerly direction have the right of way over any vehicle going in an easterly or westerly direction.

2. A witness may be cross-examined as to facts showing his favor towards the party calling him, the extent of his own interest in the case, and his bias, although the range of examination may be limited by the trial judge.—(H. E. Taylor & Co. vs. Metropolitan St. Ry. Co., 84 N. Y. Supp., 282.)

NEW YORK.—Carriers—Injury to Passenger—Care Required.

Where a passenger riding in a hired cab was injured in a collision between the cab and a street car by the concurrent negligence of the street car company and the cab driver, an instruction that the cab driver was bound to exercise a very high degree of care was proper.—(Stiner vs. Metropolitan St. Ry. Co. et al. 84 N. Y. Supp., 285.)

NEW YORK.—Negligence—Non-Suit.

In an action to recover for injuries alleged to have been sustained by the falling of a live wire on plaintiff, who was at the time riding on a bicycle, it was error to grant a non-suit on the ground that the facts testified to by plaintiff and his witnesses were incredible and scientifically impossible—the case involving electrical phenomena—where it was not shown by science and common knowledge that such testimony was absolutely false.—(Walters vs. Syracuse Rapid Transit Ry. Co., 70 N. W. Rep., 98.)

NEW YORK.—Street Railways—Collisions with Team—Negligence—Instruction—Right of Way—Ordinances.

1. Where plaintiff's evidence was that when he attempted to drive across the street railway track the car which struck his team was 100 feet away, and defendant's testimony was that it was but a few feet away, so that it could not be stopped to prevent the accident, it was error to refuse an instruction, not covered by the charge, that, if the jury found that while defendants car was proceeding in the ordinary and lawful course of business, plaintiff, with the car in full sight, drove in front of it when it was so near that it could not be stopped by the exercise of ordinary care, he could not recover.

2. Where at the time of collision the street car was going north and the team going east, and an ordinance was in evidence providing that all vehicles going north or south shall have the right of way over vehicles going east or west, charging that the rights of the parties at the place of collision were equal, and refusing to charge that by the ordinance the car going north had the right of way over the team going east, was error.—(Cushing vs. Metropolitan St. Ry. Co., 87 N. Y. Supp., 314.)

NEW YORK.—Carriers—Alighting Passengers—Negligence of Conductor—Witnesses—Medical Experts—Impeachment—Appeal—Prejudicial Error.

1. A conductor who has no notice or knowledge that a passenger intends to leave the car cannot properly be charged with negligence in starting the car.

2. In an action for injuries, where a physician testified that he refused to come to court as a witness as to plaintiff's injuries until he had been paid, and that plaintiff's attorney sent him a check, it was error to exclude a question asked for impeachment—as to how much he had been paid.

3. In an action for injuries, the exclusion of testimony as to how much a physician had been paid to testify for plaintiff could not be held harmless where the verdict rendered for plaintiff was considerable, and the physician had testified with much emphasis as to the permanent results of the accident and the weakening effect on plaintiff's arm.—(Brown vs. Interurban St. Ry. Co.,87 N. Y. Sup., 462.)

NEW YORK.—Street Railroads—Action for Damages—Instruction—Appeal and Error.

1. In an action against a street railroad for damages, where the plaintiff's contention was, as charged by the court, that the rear wheels of his wagon were struck by defendant's car, while defendant's contention was that the plaintiff drove on the track on an angle when the car was only 15 ft. or 18 ft. away, and that the wagon was struck in the side, error cannot be predicated on that part of the charge that if the jury believed that plaintiff's wagon was not struck in the rear, but was struck in the side, towards the front of the wagon, they could not, under the evidence, find a verdict for the plaintiff, no request for modification or greater accuracy of statement having been made.—Perisco vs. Metropolitan St. Ry. Co., 87, N. Y. Sup., 234.)

NEW YORK.—Street Railroads—Injury to Person on Track—Contributory Negligence.

1. Where plaintiff, in passing behind the rear of a car, stepped on an adjoining track, and was struck by an approaching car, and the evidence showed failure to exercise ordinary caution, he was chargeable with contributory negligence, as a matter of law.—(Reed vs. Metropolitan St. Ry. Co., 73 N. E. Rep., 41.)

NEW YORK.—Personal Injuries—Complaint—Evidence—Admissibility—Street Railroads—Collision—Negligence—Reasonable Care.

1. Testimony that plaintiff was suffering from kidney disease, resulting from his injuries, is inadmissible under a complaint alleging that plaintiff was thrown from his wagon to the floor of a bridge, thereby "breaking his ribs, spraining his ankle and injuring his back and right hip, and thereby made him sick, sore, lame and disabled, * * * causing him to suffer pain of body and mind, and caused him permanent injury," there being no proof that the kidney disease was necessarily and directly caused by the injuries specified.

2. Where, in an action against a street railway company for injuries sustained to a traveler in a collision with a street car, plaintiff's counsel, in summing up to the jury, claimed that, as the accident happened on a narrow bridge, defendant was bound to exercise an extraordinary degree of care in operating its cars thereon, defendant was entitled to an instruction distinctly stating that defendant's only duty was the exercise of the reasonable care which a reasonably prudent man would exercise under the circumstances; and a modification of the charge by adding that the narrowness of the passage placed on the motorman the duty of exercising greater care than he would be under if the way had been wider was reversible error.—(Lockwood vs. Troy City Ry. Co., 87 N. Y. Sup., 311.)

NEW YORK.—Master and Servant—Injuries to Servant—Dangerous Employment—Warning—Care Required—Assumption of Risk—Fellow Servant.

1. Where the excavations along a cable road, holding the wheels on which the cable ran, were not of sufficient size to permit a man to remain therein during the passage of a car, while oiling or adjusting the machinery, so that it was necessary, in performing such work, for the oiler to place his head and shoulders into the excavation, the railroad company was not an insurer of his safety from injury by approaching cars while in such position, and hence,

having furnished a competent servant to keep watch and warn the oiler of danger while in such position, was not guilty of negligence in failing to provide him with a reasonably safe place in which to work.

2. The oiler having voluntarily consented to work, with knowledge of the danger, and with the precautions afforded him, assumed the risk of injury, notwithstanding such precautions.

3. Where it was the duty of plaintiff and his foreman to oil and reset cable wheels in pits along a cable street railroad, and plaintiff and his foreman took turns, one going into the pit, while the other watched for cars and teams that might approach in order to give warning to the one in the pit to escape before being struck, plaintiff's foreman, while on watch, was plaintiff's fellow servant, so that defendant was not liable for injuries to the plaintiff by reason of the foreman's negligence in the performance of such duty. —(Ryan vs. Third Ave. R. Co., 86 N. Y. Sup., 1070.)

NEW YORK.—Carriers—Street Railway Passenger—Collision with Vehicle—Negligence of Motorman—Excessive Verdict.

1. Evidence in an action by a street car passenger for injuries received in a collision between the car and a vehicle considered, and held to sustain a verdict for plaintiff, founded on the negligence of the motorman.

2. A street car passenger was severely injured on July 26, 1899, in a collision between the car and a vehicle, by being struck by a shaft of the vehicle in the breast. He was taken to a hospital, where he remained until September, when he was sent to Maine with a trained nurse. In November he returned to the hospital, remaining there until the 29th, and was not able to return to his regular business until May, 1902. It appeared that he would never fully recover from his injuries, though he was not permanently disabled. Held that a verdict of $25,000 was excessive, and should be reduced to $20,000.—(Smith vs. Metropolitan St. Ry. Co., 86 N. Y. Sup., 1087.)

NEW YORK.—Street Railroads—Duty to Passengers—Personal Injury—Instructions.

In an action against a street railway company, an instruction that such company was obliged, "as a general proposition, to exercise that degree of care which would safely land a passenger at his destination," was erroneous as imposing too great a duty on the company, though there may have been special circumstances of danger in the particular case.—(Crolly vs. Union Ry. Co. et al., 92 N. Y. Sup., 313.)

NEW YORK—Street Railways—Injury to Passenger—Negligence —Evidence.

Negligence is not shown, but, if anything, contributory negligence, by evidence that, as a passenger who had been standing on the platform of a car of an elevated train started to enter the car, the guard closed the sliding door, jamming the passenger's fingers between the door and the sill; that the guard looked just before closing the door, and the passenger's hand was not on the sill; and that the passenger did not see that the door was being closed.— (O'Rourke vs. Interborough Rapid Transit Co., 92 N. Y. Sup., 317.)

NEW YORK.—Negligence — Evidence — Evidence — Hypothetical Question—Negligence—Evidence of Injuries.

1. Where the conductor of a street car, while standing on the platform, was thrown therefrom by a sudden jerk of the car—the car at the time being drawn by another car operated by defendant, a corporation other than the conductor's master—and there being no evidence as to what caused the jerk, the conductor was not entitled to recover.

2. In an action for injuries, in which it appeared that plaintiff had varicose veins, the court asked a physician who had examined plaintiff whether he could say that such condition was caused by the accident, to which the witness replied that it could come from the same. The court then asked, "In your opinion, did it?" and stated that witness might assume that plaintiff was a perfectly well man before the accident. The witness replied that, if the condition was not there before, it would come from the accident, and the court then asked: "Assuming all of these facts, can you say, with a reasonable degree of certainty, whether the injuries described will be permanent." Held, that the hypothetical question was objectionable as indefinite and confused.

3. In an action for injuries, held that the evidence was insufficient to show that the injuries complained of were caused by the accident in question.—(McGinness vs. Third Ave. R. Co., 93 N. Y. Sup., 787.)

NEW YORK.—Street Railways—Injuries to Passengers—Negligence—Contributory Negligence—Submission to Jury—Sufficiency of Evidence—Car Platform—Dangerous Position—Knowledge of—Duty of Passenger—Construction of Horse Street Car—Judicial Notice—Instructions—Error—Same.

1. In an action against a street railway for personal injuries received by plaintiff, a passenger, evidence held sufficient to justify submission to jury of questions of defendant's negligence and plaintiff's lack of contributory negligence.

2. A passenger on a street car cannot voluntarily place himself in a position of danger, with knowledge of the fact, and then charge dereliction on the street car company in performing its duty, if he could have removed himself from the dangerous position and thus escaped injury.

3. The court may take judicial notice of the construction of an ordinary horse street car.

4. Plaintiff boarded one of defendant's cars, and stood on the front platform, holding onto a rail behind him. The driver urged the horses to a gallop, and, when one of them partially fell, whipped it, causing it to start the car with a jerk, which threw plaintiff off, and he was injured. Plaintiff became aware of his dangerous position while the horses were galloping, but did not move, though he could have held onto the rail with one hand and opened the car door with the other, or could have requested the conductor to open it and help him into the car. Held, that the refusal to charge, as requested by defendant, that, "if plaintiff had reason to apprehend danger to himself on account of the speed of the car, it was his duty to go inside the car," was error.

5. A charge which was general in character, and left the jury to consider all the circumstances, and then say whether plaintiff exercised the care and caution of an ordinarily prudent person, did not properly present the question of the apprehended danger of plaintiff's position and his duty to enter the car.

Patterson and O'Brien, J. J., dissenting.—(Kleffmann vs. Dry Dock, E. B. & B. R. Co., 93 N. Y. Sup., 741.)

NEW YORK.—Carriers—Street Railroads—Injuries to Passengers —Contributory Negligence—Actions—Instructions.

1. Plaintiff, while waiting for a street car in a space between two tracks, not more than 5 ft. 8 ins. in width, was struck by a passenger attempting to board another car on a parallel track, and thrown under the car. The court charged that if plaintiff, in placing himself where he did, failed to exercise care for his own safety, yet if defendant's conductor was aware of plaintiff's position before he signaled the car to start, and could have avoided the accident by reasonable care, then plaintiff's original negligence would not necessarily excuse defendant's subsequent negligence or preclude a recovery. Held, that such instruction withdrew from the jury the question of plaintiff's contributory negligence, and was therefore error.

2. Where, in an action for injuries to a street car passenger, the only person in the carrier's employ charged with negligence was the conductor of a car, a requested instruction that defendant could not be held liable because the motorman of the car did not reverse the power after the accident, but relied on his brakes to stop the car, was improperly refused.—(Cunningham vs. Metropolitan St. Ry. Co., 93 N. Y. Sup., 700.)

NEW YORK.—Street Railroads—Personal Injuries—Contributory Negligence—Question for Jury—Degree of Care Required.

1. In an action against a street railroad for injuries to plaintiff working on a street, whether plaintiff was guilty of contributory negligence, held a question for the jury.

2. The rule as to the degree of care required by persons engaged in street work in watching for approaching cars is not as broad as in the case of pedestrians.—McGrath vs. Metropolitan St. Ry. Co., 93 N. Y. Sup., 519.)

NEW YORK.—Street Railroads—Injuries to Pedestrians—Acts and Emergencies—Contributory Negligence—Trespass—Negligence of Motorman—Question for Jury—Evidence.

1. Deceased, a girl fifteen years of age, while waiting at a street crossing for the passage of cars, on seeing a boy four or five years old attempt to cross in front of a car on the furthest track from her, voluntarily rushed toward him, seized and pulled him from in front of the car, and as she stepped back upon the track nearest her she was struck by a car coming from the opposite direction, which, when she started for the boy, was between 65 ft. and 200 ft. distant. The space between the tracks allowing for the widest overhang was only from 13 ins. to 17 ins., so that her only means of escape was to retrace her steps. Held, that deceased, in voluntarily placing herself in danger to save the boy, was not guilty of contributory negligence as a matter of law.

2. Deceased was not a trespasser in going in front of the car for the purpose of rescuing the boy from immediate peril.

3. In an action for the death of a pedestrian struck by a street car at a crossing, evidence held to require submission of the question of the motorman's negligence to the jury

McLennan, P. J., and Stover, J., dissenting.—(Manzella vs. Rochester Ry. Co., 93 N. Y. Sup., 457.)

NEW YORK.—Street Railroads—Injuries to Bicyclists—Contributory Negligence.

Plaintiff, on entering an avenue on which were double street car tracks, from a side street, saw a southbound car approaching about half a block away, and a northbound car approaching on the track nearest to her. She slowed up her bicyle to permit the northbound car to pass in front of her, and immediately "cut right across" behind it, in front of the southbound car, which was then so close that a collision could not be averted. Held, that plaintiff was guilty of contributory negligence, as a matter of law.—(Furlong vs. Metropolitan St. Ry. Co., 92 N. Y. Sup., 1008.)

NEW YORK.—Street Railroads—Injuries to Drivers—Contributory Negligence.

Where plaintiff, injured in a collision with a street car as he was crossing a track, testified that he plainly saw the car approaching at a high rate of speed when his horse was at the curb stone, and he attempted to cross in front of the car without accelerating the horse's speed, or paying any further attention to the car, he was guilty of contributory negligence, precluding a recovery.—(Bernstein vs. New York City Ry. Co., 92 N. Y. Sup., 228.)

NEW YORK.—Evidence—Expert Opinion—Hypothetical Questions.

Where, in an action for injuries, a physician testified that, from his examination of plaintiff and his knowledge of the subject, he could state with reasonable certainty what plaintiff's nervousness resulted from, and, being asked to state, replied, "Momentum and shock is possible to bring on this nervousness in a man," such reply was incompetent, and it was error to refuse to strike the same.—(Lazarus vs. New York City Ry. Co., 92 N. Y. Sup., 246.)

NEW YORK.—Street Railroads—Injury to Pedestrian—Negligence—Contributory Negligence—Burden of Proof.

Evidence in an action by a pedestrian against a street railway company for injuries sustained in a collision with a street car considered, and held insufficient to sustain the burden on plaintiff of proving negligence on the company's part and of proving himself free from contributory negligence.

Giegerich, J., dissenting.—(Gentile vs. New York City Ry. Co., 92 N. Y. Sup., 264.)

NEW YORK.—Street Railroads—Speed of Cars—Ordinances—Applicability—Damages—Permanent Injuries—Sufficiency of Evidence—Witnesses—Failure to Produce—Unfavorable Presumption—Instructions.

1. An ordinance declaring it unlawful for any cart, wagon, or other vehicle used to carry passengers to be driven through the streets at a greater than specified speed is not applicable to street surface cars operated by electricity.

2. In an action for personal injuries, evidence held insufficient to show that there was any permanent injury, such as to authorize an instruction hypothesized on the existence of such an injury.

3. A charge that the jury may consider the fact that defendant produced no witnesses is erroneous, in the absence of evidence that defendant had any witnesses which it could produce, and where there is no showing that anybody except the witnesses examined by plaintiff, and a servant of defendant, who is not shown to be available, can testify upon the subject.—(Robinson vs. Metropolitan St. Ry. Co., 92 N. Y. Sup., 1010.)

NEW YORK.—Carriers—Injury to Passenger—Contributory Negligence.

Plaintiff sued to recover for injuries received while attempting to board a moving street car, claiming that they were caused by the act of the conductor in increasing the speed at that time so that he was thrown against a barrier surrounding an excavation in the street. He knew of the barrier, and when he attempted to board he stood within 3 ft. or 4 ft. of it. Held that he was guilty of contributory negligence.—(Berry vs. Utica Belt Line St. Ry. Co., 73 N. E. Rep., 970.)

NEW YORK.—Street Railroads—Injuries to Workmen—Contributory Negligence—Evidence—Instructions—Requests—Exceptions.

1. Plaintiff was struck and injured by a street car while he was engaged in constructing a fence in the street, surrounding a street improvement, about 30 ins. from the track. He knew the cars were passing every two or three minutes, and that the place where he was working was dangerous. With such knowledge, however, he worked on, without paying any attention to passing cars; relying on his hearing the bell when one approached. A car approached while he was stooping over, nailing a board on the fence; and, though other workmen got out of the way and were uninjured, plaintiff was struck. Held that plaintiff was guilty of contributory negligence, as a matter of law.

2. In an action for injuries to a workman in a street by being struck by a street car, the court charged that plaintiff was bound to exercise the care which a careful man would exercise in plaintiff's position, and that his failure so to do, if it contributed to the injury, would entitle defendant to a verdict. Defendant then asked the court to charge that, if plaintiff was working in a place known by him to be dangerous, he was required to keep his senses alert and be vigilant to look out for cars and avoid them at the time of their passage, to which the court answered, "He was bound to exercise that care and diligence that a careful and prudent man would exercise under the circumstances similar to the ones that he was working under at that moment," whereupon defendant's counsel excepted. Held that the exception was to the court's refusal to charge as requested, and not to the charge of the court in answer to the request.

3. The charge of the court did not cover defendant's request, and the refusal thereof was error.—(Hennessey vs. Forty-Second St., M. & St. N. Ave. Ry. Co., 92 N. Y. Sup., 1058.)

NEW YORK.—Street Railroads—Injuries to Bicyclist—Contributory Negligence.

Plaintiff, approaching a street railway track to cross the same, looked for cars approaching when he was some 15 ft. south of an elevated railway pillar, and, not seeing any car, attempted to cross the track after turning sharply to avoid the pillar, without looking again, and was struck by a car which was so close to him that a collision was unavoidable. Held that the fact that plaintiff looked once in the position where he was did not justify him in afterwards turning and crossing the track without making an attempt to ascertain if it was safe to cross, and that he was guilty of contributory negligence, as a matter of law.—(Knapp vs. Metropolitan St. Ry. Co., 92 N. Y. Sup., 1071.)

NEW YORK.—Carriers—Street Railroads—Injuries to Pedestrians—Premature Start—Actions—Instructions—Exceptions.

1. Where, in an action for injuries to a passenger while boarding a street car, his evidence that the car was still when he attempted to board it, and was started with a sudden jerk, was uncorroborated, and was contradicted by three other witnesses, it was error to charge that in determining the weight of the evidence the jury might consider whether it was reasonable to believe that people of plaintiff's age would run for a car and try to board it, and "whether people do that sort of thing" in the city where the accident occurred.

2. In an action for injuries to a passenger the court charged that the jury might consider whether it was reasonable to believe that a man of plaintiff's age would run for a car and try to board it, and "whether people do that sort of thing in the city of New York." Defendant's counsel excepted to that portion of the charge "that the jury may consider the inference from their own daily experiences whether these things do occur or not in the city of New York in their daily travel." Plaintiff's counsel thereupon denied that the court had used such language, when the court stated that he heard what defendant's counsel said, and submitted the question to the jury. Held a sufficient exception to the instruction given.—(Hanau vs. Metropolitan St. Ry. Co., 92 N. Y. Sup.)

PENNSYLVANIA.—Carriers—Negligence of Passenger.

1. It is negligence per se to attempt to get on and off a moving car, whether propelled by steam or electricity.

2. Where plaintiff attempted to get on a moving electric car, and was safely on when he was thrown off by the act of the motorman in suddenly starting the car with a jerk, the company is liable, though the original act of plaintiff was negligent; but if the sudden jerk happens while plaintiff is getting on the car, and before he has reached a place of safety, the company is not liable.—(Boulfrois et al. vs. United Traction Co., 59 Atl. Rep., 1007.)

PENNSYLVANIA.—Street Railroad—Collision With Wagon—Evidence.

In an action against a street railway company for injuries received by a collision between a car and a wagon, evidence held to sustain judgment for plaintiff.—(Kennedy vs. Consolidated Traction Co., 50 Atl. Rep., 1005.)

PENNSYLVANIA.—Street Railroads—Death of Pedestrian—Negligence.

In an action against a street railway company to recover for the death of a pedestrian, the evidence showed that decedent was last seen standing on the curb looking up and down the electric track, and was not found lying against the curb, having been struck by a car running at an unusual speed. Held, that the question of the railroad company's negligence was for the jury.—(Haughey et al. vs. Pittsburg Railways Co., 59 Atl. Rep., 1108.)

PENNSYLVANIA.—Death by Wrongful Act—Action—Parties—Appeal.

1. Under Act April 26, 1855, Sec. 1 (P. L. 309), providing that

persons entitled to recover damages for an injury causing death shall be the husband, widow, children, or parents of the deceased, where a husband is killed through the negligent act of another, leaving a widow and several children, the action for damages must be brought by the widow alone, though the damages are to be shared with the children.

2. Where an action for wrongful death should be brought by the widow alone, and a nonsuit is entered in a suit by the widow and children, an appeal by the children separately in their own names will be quashed.—(Haughey et al. vs. Pittsburg Railways Co. (No. 2), 59 Atl. Rep., 1112.)

RHODE ISLAND.—Negligence—Street Railways—Personal Injuries—Sufficiency of Evidence—Verdict—Remarks of Counsel—Propriety of.

1. In an action against a street railway to recover for injuries alleged to have been received by plaintiff by reason of defendant's negligence in starting its car while plaintiff was alighting therefrom, plaintiff was the sole witness as to the accident, although there were a number of other passengers on the car, including an acquaintance of plaintiff, who sat on the seat beside her, and alighted just before plaintiff did. The conductor, motorman, and such passengers as were called as witnesses positively denied that the accident occurred. Held, that a verdict for plaintiff was not sustained by the evidence.

2. In an action for personal injuries against a street railway company, where plaintiff was the sole witness as to the alleged accident, argument of plaintiff's counsel that either she was injured as she testified, or was guilty of perjury in so testifying, because it was a matter concerning which she could not be mistaken, was proper.—Heltzen vs. Union Ry. Co., 59 Atl. Rep., 918.)

RHODE ISLAND. — Carriers — Negligence—Presumption—Evidence—Collision with Vehicle.

1. In an action for injuries to a passenger by a collision between a car in which he was riding and a vehicle which turned on the track from a country road, the fact of the collision raised no presumption of negligence.

2. In an action for injuries to a passenger owing to a collision between an electric car and a vehicle which turned off a road onto the track, evidence whether the track was wet or dry on the night in question, and testimony as to how far witness could see on such a night, and within what distance a car could be stopped at the place where the accident occurred, was inapplicable, in the absence of any evidence that the vehicle was on the track until the instant of the collision.—(Fagan vs. Rhode Island Co., 60 Atl. Rep., 672.)

TEXAS.—Street Railways—Persons on Streets—Injuries—Discovered Peril—Duty of Motorman.

1. Where the motorman of a street car saw that a boy on the street would probably run upon the track in front of the car, it was his duty to use every means in his power consistent with the safety of those on the car to prevent injury to the boy, and it was not sufficient for him to wait until the boy ran upon the track just in front of the car, when the danger was so imminent that the injury could not have been averted.

2. Where a motorman saw that a boy on the street paid no attention to the sounding of the gong and his hallooing to him, ordinary care on his part required him to lessen the speed of the car, and not to attempt to run by the boy until satisfied that the latter was aware of the approach of the car.—(Galveston City Ry. Co. vs. Hanna, 79 S. W. Rep., 639.)

TEXAS.—Personal Injuries—Proximate Cause—Contributory Negligence—Elements of Damages.

1. Though plaintiff was guilty of negligence contributory to his injury, he may recover if such injury was more immediately caused by defendant's omission, after becoming aware of plaintiff's peril, to use ordinary care to avoid the injury.

2. In an action for injury to a boy 14 years old, evidence that he suffers from severe pain in the head, that "he was a bright boy" before the injury, and that he is now "dull, and does not understand" what is said to him, is sufficient on which to base an instruction to "consider, in estimating his damages, the probable effect and duration of the injury, if any, to his mind in the future."—(El Paso Electric Ry. Co., vs. Kendall, 85 S. W. Rep., 61.)

TEXAS.—Carriers—Street Railroads—Injuries to Passengers—Damages—Instructions—Appeal—Assignments of Error.

1. Where an assignment of error complains of a clause in the charge, but neither the assignment nor the proposition thereunder points out the error, the assignment presents nothing for review.

2. An instruction in an action for injuries that, in estimating plaintiff's damages, the jury may consider mental and physical pain and suffering, if any, endured by plaintiff, resulting from his injuries, if any, the time necessarily lost, if any, by reason of his injury, if any, and authorizing an allowance of such a sum as the jury may believe from the evidence will be fair compensation for the injury, if any, sustained, was not objectionable as permitting double damages.

3. Where, in an action against a carrier for injuries to a passenger, he sustained a fracture of a rib, suffered and continued to suffer great pain in his side, heart and back, and had only partial use of one of his hands, as the result of his injuries, a verdict for $750 was not excessive.—(San Antonio Traction Co. vs. Sanchez, 84 S. W. Rep., 849.)

TEXAS.—Street Railroads—Defective Track—Drivers—Injuries—Instructions.

1. In an action for the death of plaintiff's husband while driving over defendant's street railway track, an instruction that people passing over the street were entitled to travel on that part thereof on which the track was laid, but that it was deceased's duty, while so traveling, whether the street was in good or bad condition, or whether he was on or off that part occupied by the street car track, or driving on or off the track, to exercise ordinary care to prevent injury to himself, though not reversible error, was objectionable as misleading.

2. Though the public has an equal right with a street railway company to the use of city streets, if the street is defective by reason of defectively laid tracks of a street car company, which defect is obvious, a traveler thereon is not entitled to go on the street, unless, in view of the surrounding circumstances, a person of ordinary care would do so.

On Rehearing.

3. Where plaintiff's husband fell from his wagon, and received injuries from which he died, while crossing defendant's defective street car track, and defendant pleaded that deceased was guilty of contributory negligence, and the court charged that if deceased knew, or should have known, of the defective condition of his wagon, and voluntarily drove the wagon astride the rail of defendant's track, where such movement was unnecessary, and knew, or could have known by the exercise of care, that the track was defective, and in so doing did not exercise ordinary care for his safety, and as a result thereof was injured, defendant was not liable, such charge sufficiently covered a requested instruction that if the track was dangerous, and deceased attempted to cross the same after he saw or could have discovered the defect in the exercise of ordinary care, and an ordinarily prudent person would not have done so, deceased was negligent in so doing, and defendant was not liable.—Citizens' Ry. Co. vs. Gossett et al., 85 S. W. Rep., 35.)

TEXAS.—Written Contract—Parol Modification—Evidence—Release—Fraud—Personal Injuries—Damages—Miscarriage.

1. Where a release of a claim for personal injuries stated that in consideration of a certain sum, the receipt of which was acknowledged, and the assumption of a physician's bill, all liability growing out of the accident was released, etc., the release was a complete contract, and parol evidence was not admissible to show that there was an additional agreement that the releasor should be given employment.

2. Where a release of a claim for damages for personal injuries is procured by promises to give the releasor employment, which promises the other party has at the time no intention of performing, the release is voidable for fraud.

3. Where, as a result of an injury alleged to have been caused by defendant's negligence, plaintiff's wife suffered a miscarriage, and some time thereafter had another miscarriage, the jury should have been instructed to consider the second miscarriage for the purpose of determining the extent of the injury, and not for the purpose of allowing specific damages for that miscarriage itself.—(Rapid Transit Ry. Co. vs. Smith, 86 S. W. Rep., 322.)

TEXAS.—Railroads—Persons on Track—Death—Care Required—Actions—Instructions—Harmless Error.

1. Where, in an action for death of plaintiff's husband by being run over by defendant's street car, there was evidence that he was lying on the track in an intoxicated condition when killed, an instruction assuming that deceased was attempting to cross the track when killed was properly refused.

2. Where plaintiff's husband was lying on defendant's street car track in an intoxicated condition when he was run over and killed, an instruction that the motorman was guilty of negligence if by ordinary care he could have discovered deceased in time to avoid striking him was properly refused, as defendant would be guilty of negligence only for failure to use proper diligence to prevent injury to deceased after he had been actually discovered on the track.

3. Where plaintiff's husband was lying on defendant's street car track intoxicated when he was run over and killed, and the undisputed evidence showed that the motorman did everything in his power to avoid striking him after he was discovered, an erroneous

instruction that if the speed of the car was less than 15 m.p.h., the same was not negligence, and plaintiff could not recover if deceased was lying on the track, unless she proved that the motorman could by the use of means reasonably within his power have stopped the car after he saw deceased before striking him, was not prejudicial to plaintiff, the charge being correct as a whole.—(Taylor vs. Houston Electric Co., 85 S. W. Rep., 1019.)

VIRGINIA.—Street Railways — Vehicles — Care — Instructions — Harmless Error.

1. A street railway company operating its railway upon a public street cannot run down a vehicle from behind, under any ordinary circumstances, without negligence or willful wrong.

2. It is not negligence to drive a vehicle, with curtains down on the sides and rear, upon the tracks of a street railway in a public street.

3. Where, upon the whole record, a different verdict could not have been found, the judgment will not be reversed because of error in giving or refusing instructions.—(Richmond Passenger & Power Co. vs. Allen, 40 S. W. Rep., 656.)

VIRGINIA.—Street Railroads—Crossing Accident—Negligence—Instructions—Error.

1. In an action against a street railroad for personal injuries by being struck by an electric car while driving across defendant's tracks, the plaintiff is entitled to recover where the motorman could have avoided the accident by the use of ordinary care after he saw, or by the use of ordinary care might have seen, that the plaintiff was on, or very near, the track, and driving towards it, and was in danger of being struck by the car, though the plaintiff was guilty of want of ordinary care in attempting to cross the tracks.

2. In an action against a street railroad for personal injuries by being struck by an electric car while driving across defendant's tracks, where there is evidence that the case comes within the general rule as to contributory negligence, and also that the case comes within the exception to the rule, it is error to refuse a charge requested by defendant that there can be no recovery where the accident was caused by the concurrent negligence of the motorman and plaintiff, due to each failing to keep a proper lookout.

3. A charge that it is not negligence, as a matter of law, to omit to look and listen for cars when one is about to cross the tracks of a street railway, but the question is "whether a man of ordinary prudence exercising ordinary care and prudence would have thought it unnecessary to do so," contains a proper definition of ordinary care.

4. Where the evidence in an action against a street railroad for personal injuries by being struck by a car while driving across defendant's track raised the questions of negligence and contributory negligence, a charge correctly stating the law as to the burden of proof on those questions cannot be regarded as abstract, or as tending to mislead the jury.—(Richmond Passenger & Power Co. vs. Gordon, 46 S. E. Rep., 772.)

WASHINGTON.—Street Railroads—Injuries to Pedestrians—Crossing Track—Contributory Negligence.

Plaintiff attempted to drive a team dragging their doubletrees obliquely across defendant's street car track at night, and saw and heard the car by which he was struck when a block away, and knew that it was coming down a steep grade. The car was lighted, and visible to him all the time, but he paid no further attention to it until just before he was struck, when it was too late for him to escape. The motorman had no opportunity to see plaintiff until he came within the rays of the headlight, when he was unable to prevent the accident. Held that plaintiff was guilty of contributory negligence as a matter of law.—(Criss vs. Seattle Electric Co., 80 Pac. Rep., 525.)

WASHINGTON.—Street Railroads—Personal Injuries—Contributory Negligence—Passengers—Who Are—Evidence.

1. In an action against a street railroad for injuries to plaintiff boarding a car inside defendant's street car barn, evidence held to show that defendant was not a carrier of passengers in the barn, so as to render it liable for negligence in the construction of the barn.

2. Plaintiff was injured in attempting to enter an electric car through the front entrance, which was a dangerous place to enter, after the signal to start had been given, and before it had emerged from a barn used for the housing and repair of its cars, and while the car was not to exceed 3 or 4 ft. from the barn door, so that he would inevitably be caught in passing through the door, unless he got inside the car before it reached the barn door, which he failed to do; all of which dangers were open, and which he had a better opportunity to observe than any other person. Held, that he was guilty of contributory negligence as a matter of law, which was the direct and proximate cause of his injuries.—(Kroeger vs. Seattle Electric Co., 79 Pac. Rep., 1115.)

WEST VIRGINIA.—Action by Wife—Personal Injuries—Damages — Evidence — Contributory Negligence — Instructions — Street Railroad—Injury to Passenger—Verdict—Excessive Damages.

1. In an action by the wife for the recovery of damages for personal injuries sustained by her, she may or may not, at her election, join her husband as co-plaintiff.

2. When the wife sustains personal injuries, and brings an action to recover damages therefor, she may recover for being prevented from performing and transacting her necessary affairs and business by her to be performed and transacted, if such prevention is the result of the injuries for which she sues.

3. In an action for personal injuries, where, as a result of such injuries, a surgical operation is necessary to be performed, evidence which shows, or tends to show, that such operation was attended with great difficulty and dangers, and that comparatively few physicians perform such operation, is admissible.

4. A plaintiff, in an action for damages for an alleged negligence of another, is not required to exercise more care than is usual, under similar circumstances, among careful persons of the class to which said plaintiff belongs.

5. When an action is brought to recover damages for personal injuries sustained by the plaintiff on account of the defendant's negligence, it is not error to omit to instruct the jury as to the law of contributory negligence in an instruction given for the plaintiff, when the court, in giving the defendant's instructions, instructs the jury fully and fairly on that point.

6. It is not error to instruct the jury that the loss of child-bearing power is an element of damage to be considered by them in an action for personal injuries sustained through the negligence of the defendant, when such loss is the reasonable and probable result of such negligent act.

7. Where a street car company stops its cars for the purpose of receiving passengers, it is charged with the highest degree of care to see that all passengers lawfully entering its cars get to a place of safety thereon before starting its cars.

8. A case which was proper to be submitted to the jury on the question as to whether or not the plaintiff was guilty of contributory negligence.

9. In an action to recover damages for personal injuries, the court will not interfere with the verdict of a jury, on the ground that the damages found are excessive, unless the finding is so manifestly unjust as to show partiality, prejudice, or misapprehension on the part of the jury. (Syllabus by the Court.) (Normile et al vs. Wheeling Traction, 49 S. E. Rep., 1030.)

WISCONSIN.—Street Railroads—Collision—Proximate Cause—Evidence—Sufficiency—Instructions—Admissibility of Evidence—Contributory Negligence—Imputed Negligence.

1. Plaintiff, who had been driving behind a wagon loaded with wood, turned out onto the street railroad tracks, when a collision ensued with a car approaching from the opposite direction. In an action for the injuries, plaintiff's witnesses estimated the height of the wagon, but there was no evidence as to whom the wagon belonged to. Held proper to admit on behalf of defendant the testimony of a witness who had been in the lumber business for twenty-five years as to the height of an ordinary wood wagon used in the city.

2. A remark of the court, on overruling an objection to the question to the witness calling for the height of the ordinary wood wagon, that the fact that it was a wood wagon was the only information the jury had received, was not reversible error.

3. Remarks of the trial court on overruling an objection to testimony are not subject to review on appeal unless excepted to.

4. In an action for injuries sustained by plaintiff in a collision between her vehicle and one of defendant's street cars, evidence held sufficient to sustain a finding that negligence of defendant was not the proximate cause of the injury.

5. In an action for injuries to plaintiff in a collision between her vehicle and one of defendant's street cars, an instruction requested by plaintiff as to the reckless conduct of a person in the face of "unexpected and deadly danger" was properly refused; there being evidence that the danger was created by plaintiff herself.

6. In an action for injuries to plaintiff in a collision with a street car, the court charged that a traveler desiring to cross the street car track has not the same right to require the speed of the car to be slackened as the person in charge of the car has to require him to give way; that it was the duty of a traveler to look and listen for a car, and as much his duty to see an approaching car in plain sight, and in dangerous proximity to the crossing, and not to get in the way of it negligently, as to look for it; and that testimony of a person that when approaching a track he looked along it for a car, and did not see it, although one was in plain sight, was inconsistent with reasonable probabilities. Held that such instructions were not erroneous.

7. The driver of a private conveyance is the agent of the person in such conveyance, so that the driver's negligence contributing to an injury to the other precludes any recovery.—(Lightfoot vs. Winnebago Traction Co., 102 N. W. Rep., 30.)

ANNUAL CONVENTION OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

The annual convention of the American Institute of Electrical Engineers was held last week at Asheville, N. C. The meetings commenced June 19, and extended through to June 23. Tuesday, June 20, was designated as "Railroad Day," and the papers presented at the meeting were as follows:

"Three-Phase Traction," by F. N. Waterman, mechanical and electrical engineer, New York.

"Heavy Electric Freight Traction," by C. De Muralt, electrical engineer, New York.

"Weight Distribution on Electric Locomotives as Affected by Motor Suspension and Draw-Bar Pull," by S. T. Dodd, Schenectady, N. Y.

"Choice of Motors in Steam and Electric Practice," by William McClellan, Philadelphia.

"Electrical Features of Block Signaling," by L. H. Thullen, Pittsburg.

The papers were presented in the order given above. A digest of Mr. Waterman's paper is given below:

THREE-PHASE TRACTION. BY F. N. WATERMAN.

The paper furnishes a comprehensive comparison of the performance of the direct-current and single-phase systems with that of the three-phase system, as represented by the Ganz system installed on the Italian Valtellina road, and tends to show that, when the equipment of each is considered as a whole, the three-phase equipment possesses characteristics which render it preferable in many cases. Most of the objection that has been raised in this country to the use of three-phase motors for railway purposes finds its origin, directly or indirectly, in the question of the air-gap, the assumption being made that the requirements in this respect as determined by direct current practice are controlling and final. European practice, however, does not support this conclusion. In papers by Mr. De Muralt and Mr. Berg, read before the Institute some years ago, the conclusions reached were adverse to the adoption of three-phase motors for traction. Basing his calculations on the assumption made by Mr. Berg as to service conditions with direct-current motors and comparing them with identical calculations made from the performance curves of three-phase motors having the same depth of air-gap as is employed on the Valtellina line, the author shows that, instead of the alternating-current system taking 26 per cent more real power and 22 times as many volt-amperes as the direct-current systems, as stated by Mr. Berg, the three-phase system requires only 5 per cent more real power and 32 per cent more apparent power than the direct-current system, transmission losses being neglected in each case. When proper account is taken of the transmission losses and the initial cost of the installations, it is found that with three-phase motors having small air-gaps there is a reduction of 12 per cent in the first cost, 3.8 per cent in power consumption, elimination of the attendance and repairs on synchronous converters, and on motor commutators, as compared to the direct-current system, while the disadvantages are that there are three overhead wires to be maintained instead of a third rail, and the expense of caring for motor bearings to keep the rotors centered.

In this connection the experience on the Valtellina line is interesting. At the time of the writer's visit, this line had been operating ten motor-cars and two locomotives, having four motors each, for about 18 months in regular service, and for more than a year in more or less regular, although experimental, service. During the entire period three bearings had burned out, two by leakage of water into the oil-reservoirs, and one by running dry. In neither case were the motors otherwise injured. No other repairs to bearings had been made. The maximum wear at the end of the first 25,000 miles of regular service, as determined by the repair department, was 0.3 mm., or about one-third the available life of the bearings. The total distance that the car had run was estimated as at least 50,000 miles, thus indicating a life for the bearings of 150,000 miles. The motor-bearings are very large and massive and are provided with ample oil reservoirs. The three-phase motor construction is particularly favorable to ample bearings on account of the large diameter and absence of commutators, the bearings being largely housed within the rotor. Experience on the Valtellina line shows that, so far as main line railways involving considerable distances are concerned, the cost of maintenance of overhead structures is not determined by the amount of actual labor required for repairs, but by the necessity of maintaining a force sufficient for regular patrolling and prompt action in emergencies. The cost of maintaining two overhead wires is therefore not greater than for a single wire under such conditions. The author also referred to the practical value of the ability to restore energy to the line, possessed by the three-phase system.

The discussion was opened by W. W. Smith, who thought that it was inadvisable to consider the use of constant-speed motors, because their weight must be greater than that of direct-current motors, giving a constant power with varying speed. He also said that the ratio of dead to live load on a train must be higher with three-phase motors than with either single-phase or direct-current series motors.

Mr. Steinmetz said that in any extended application of three-phase motors to traction purposes, there would be a great many problems to be solved which did not appear in the Valtellina system, which is relatively a small one. Thus, on a trunk railroad system it would not be permissible to have the speed of the generator increased and pulled down by the demands made upon it by a heavy train on a steep grade. He also thought that the necessity of using two overhead conductors would be a serious handicap, especially in a large switching yard like that of the New York Central Railroad. Moreover, the low uncommercial frequency of 14 cycles is impracticable in view of the magnitude of existing plants.

Mr. Mailloux thought that the three-phase system was applicable to some special conditions existing in Europe, but would not find much use here. The fundamental objections to the system are the double-trolley wire and the small air gap in the motor. Mr. Stott pointed out that the cost of operation is not proportional to the kw-hours alone; the cost per kw-hour is universally proportional to the load factor, so that a small saving in kw-hours per ton-mile might be unimportant.

Mr. De Muralt in replying to Mr. Steinmetz's objections said that a single train would not affect the generators seriously when other trains were running, because the three-phase system would naturally be used only for long-distance work on roads operating many trains. He also said that a three-phase motor is lighter than a direct-current motor of the same output and heating characteristics. In regard to the switch-yard problem, he said that the yards on the Valtellina Railway were more complex than those of the New York Central Railroad, although they were not so large as the latter.

Messrs Stanley and Kintner discussed the paper briefly.

Mr. Waterman, in conclusion said that the total car equipment with the three-phase system does not exceed that required under direct-current operation for the same conditions. He also said that on the Valtellina Railway the small air gap used in the motors had proved entirely practicable.

Mr. De Muralt's paper was then presented. It follows in abstract below.

HEAVY ELECTRIC FREIGHT TRACTION. BY L. CARL DE MURALT

The author compared the different electrical systems; direct current with three phase transmission, three-phase, single-phase and direct-current motors on the cars with single phase on the trolley wire. The first two do not show much difference so far as actual energy consumed by the motors is concerned. The writer presented estimates of the cost of equipment of a line 233 miles long, with 23 sub-stations, and from 4000 to 5000 hp, showing a cost of $2,792,552 for direct current, and $1,867,716 for three-phase. The cost of operation would also be less for three-phase. He did not believe single-phase motors suitable for heavy work on account of being restricted to 200 to 300 volts at the commutator, and on account of their great weight. The fourth system, while desirable for heavy low-speed freight traffic, has no great advantages as to warrant its adoption in preference to the straight three-phase system.

The writer concludes that of all the systems the three-phase is not only the cheapest to install and to operate, but that the three-phase induction motor also proves itself at least equal in every respect to the continuous-current series motor and superior to it in several rather important points. There remains only one objection to the three-phase system as such, and that is the two overhead wires which it makes necessary. That one wire is simpler to install than two is undoubtedly true. But to judge from this that a double line is impossible, or even only that it will present difficulties, is not justified by the actual facts. The successful operation of a good number of three-phase railways proves the feasibility of the two-wire overhead line beyond doubt, and it is worthy of note that some of these roads have very complicated switching yards. The construction of the necessary aerial switches has been worked out with such complete success that it is possible to stop a locomotive directly underneath a switch and start it in the same or the opposite direction without any trouble whatever. And these aerial switches are not very complicated either. It must be, of course, admitted that a double line will cost somewhat more for repairs than a single line. Yet it will always be necessary in any electric railway system to have a repair gang ready for emergencies, and these men will be able to look after two wires as well as after one. The difference in cost is thus limited to the difference in cost of material. And it is well to remember that the cost of maintenance of contact lines is very small in any case, compared with the cost of motor repairs. In street railway systems the motor repairs cost anywhere from four to ten times as much as the line repairs. The difference in cost which may be charged against the alternating-current system on this account is therefore a small per cent of an already small item, and it is quite certain that this difference will be more than counterbalanced by the greater cost of repairs to continuous-current motors, due to the presence of the commutator which has no counterpart in the three-phase induction motor. The three-phase motor is probably the most robust of electrical machinery extant, and it may well be hoped that it will be used extensively in railroad work in the future.

In the discussion which followed, Mr. Mailloux argued that while induction motors could be built for high acceleration and overload capacity, their cost would be prohibitive. He knew of no three-phase motors which had been built for an acceleration above 1.1 miles per hour per second. Mr. Dodd referred to the differences in wheel diameters which would be due to wear, and which would render three-phase multiple-unit operation impracticable because the motors run at different speeds and so upset the load distribution.

Mr. Waterman stated that within reasonable acceleration limits the cost per kw-hour per ton-mile is less with three-phase motors than with direct-current motors,and the comparison becomes even more favorable for three-phase motors when high acceleration was used. He claimed that there was no electrical or mechanical difficulty or excessive cost in building three-phase motors to give an acceleration of 2.5 miles per hour per second.

Mr. Steinmetz thought that the author's conclusions were right, but that his premises were doubtful. He said that induction motors built to give a high acceleration, and with great overload capacity are costly, and have a very poor power factor at their rated load. If the rotors and collector rings are built of ample size to provide for heat radiation, no room is left for the increased bearings required by the small clearance. The advantage claimed for three-phase motors, of ability to return power to the line, increases instead of decreases the load variations at the power station. It was perfectly practicable to return power to the line with direct-current motors, but it had not been found to be worth the extra complications involved. Three-phase motors cannot return power to the system except in concatenation, when the low efficiency causes excessive heating.

Mr. De Muralt replied that with an overload capacity of about three times the rated load, the power factor at the rated load can be kept fairly high.

Mr. Dodd's paper was then read. An abstract follows:

WEIGHT DISTRIBUTION ON ELECTRIC LOCOMOTIVES AS AFFECTED BY MOTOR SUSPENSION AND DRAW-BAR PULL

BY S. T. DODD

In a locomotive propelled by electric motors the motor action produces a set of stresses acting between the truck-frame, motor supports and driving-wheels. The horizontal effort at the rail-head resulting from these stresses acts against the resisting forces of the locomotive, the principal items of which may be considered as: (*a*) The rolling friction of the wheels on the track, acting at the rail-head; (*b*) the resistance to acceleration due to inertia of the locomotive, and the resistance due to grades, acting at the center of gravity of the locomotive; (*c*) the air resistance, acting at the exposed surface, particularly at the head end; (*d*) the resistance of the trailing load, acting at the draw-bar.

The effect of the forces here discussed, including the internal or driving forces acting between truck, motor and wheels, and the external or resisting forces, produces a shifting or redistribution of the weight on the various wheels.

Stresses acting on a spring-supported locomotive produce a compression of journal-box springs and a consequent shifting of the center of gravity of the locomotive and a redistribution of the weight on the wheels. A certain amount of redistribution of weight due to this cause may be assumed, but it has been omitted in the following discussion for the reason that it cannot be investigated without a knowledge of the elasticity of the springs.

The resistance due to inertia assumes particular importance in the case of single motor-cars subjected to high acceleration. The air resistance also is of particular importance in single high-speed motor-cars. In a purely locomotive problem such as considered here—that is, in the case of a motor car used only for drawing trailing loads—the weight of the locomotive is often less than 10 per cent of the weight of the trailing load. The resistances due to the locomotive itself are therefore not as important as those due to the rest of the train, and consequently no great error will be introduced into our results, and their expression can be much simplified by leaving out of consideration the weights and resistances of the locomotive itself, and by considering the entire reaction against horizontal effort to be concentrated at the draw-bar.

The author derives formulas for showing the stresses in the various parts of a locomotive and applies these formulas in order to indicate the approximate amount of variation in locomotives as actually constructed. From the calculation it appears that there is an element of uncertainty in the determination of the tractive effort of electric locomotives, on account of the different distribution of weight on the drivers, which seems not to have been very closely considered heretofore.

It appears that in actual cases the reduction in draw-bar pull may amount to anywhere from 6 per cent to 24 per cent of its theoretical value. The author suggests that in the design of electric locomotives it would be advisable to keep in view an arrangement of motor suspension which will give the lowest possible value of the ratio between the increase of weight on any axle and the horizontal effort per driving-axle.

Mr. Mailloux commended Mr. Dodd's paper highly. Mr. Waterman stated that Mr. Stillwell had previously called attention to the differences in the slipping point of different wheels on the same car, in connection with the work of the Manhattan Railway Company, and he thought that the author's paper had a valuable bearing on that difficulty. The meeting then adjourned.

In the session held in the evening of June 20, Mr. McClellan's paper was read.

CHOICE OF MOTORS IN STEAM AND ELECTRIC PRACTICE

BY WILLIAM M'CLELLAN

The author discussed certain features characteristic of steam and electric locomotives, and called particular attention to some important points. There is given a large collection of data relating to the steam locomotives used on all of the important roads of the United States and Mexico, which serves to show that there is no standard or demand for standards in locomotive practice.

Looking for standards in electric car motor design meets with little more success than with the design of steam locomotive. The motor, gears, and wheels may be considered as equivalent to the locomotive, since the electrical engineer is concerned only with weight above the trucks. There are many variations in the motor itself for any given type; that is, variations in the armature and field-turns. This will always be more or less necessary. At first sight, it would seem that there is some uniformity in gear-ratios, but the writer has been able to count no less than 48 gear-ratios, varying from one or gearless to 4.78. To form these ratios, 60 different combinations of gear and pinion were used. This entails a stock, of patterns at least, of 40 gears. For a long time 33-in. wheels have been standards for the larger portion of electric cars. With the arrival of the heavy car and rapid acceleration, this size has been found too small, and there are now in use wheels of 33, 36, 40, 42, 44, 49 and 62 ins. in diameter. It is not likely that many wheels larger than 62 ins. will be used, for with the adoption of the gearless motor, if it is successful on the durability test, wheels will be designed strictly with reference to the room for equipment required beneath the car. Even if the future heavy motors are not gearless, the wheels will be as small as possible, in order partly to prevent the lifting of one end of the truck at acceleration and braking.

The standardizing of apparatus arranges itself naturally under two heads: Desirability and Possibility. From the standpoint of desirability, there seems to be little room for argument, for in other lines of industry standardization has always reduced the cost of production. Standardization also means greater promptness in delivery of orders; for where parts are odd, either a large stock must be kept or pieces manufactured as they are wanted. Moreover, in the absence of standard parts little stock can be manufactured in advance of sale; that is, for new equipment. The cost of operation has always been greatly reduced by standards. Repairs and replacing of worn-out parts are greatly facilitated. The great lack of data, which we all are deploring at present, is of course due to the complexity of the traction problem. Much of this would be removed if motors were made to vary as little as possible. The same motor, with a slightly different gear-ratio, may have much greater heating effect on the same service; and it only renders this problem more complex to have all varieties of ratio unless there is some necessary reason.

There are several reasons why there should be little place for a large number of motors with slight differences. These are: (1) The small amount of information regarding operation of motors *under commercial conditions;* (2) The inability to calculate closely a motor for a given project in spite of the skill shown in speed-time curves and the like; (3) The fact that few or no precautions are taken, or even can be taken, to have the motors operated under the exact conditions by which they were calculated.

In conclusion, the author said that it must be conceded that too much conservatism would stifle proper experimenting, and retard real progress. "We must have experimental work, and the more of it the better. But it should be done rationally, that is, with an end in view which is definite. Men in authority should be perfectly sure that demands for changes in standard types are based on accurate information, and not on prejudice, whims and the like. If this position is taken, especially as large systems come and increase, there will be no danger of the semi-chaotic condition that exists in some other branches of industry."

In the discussion Mr. Steinmetz thought that rather than attempt to standardize new systems, those already known and found reliable should be adopted. Mr. Mailloux agreed that the standardization of electric locomotives is not yet practicable, but disagreed with Mr. Steinmitz's remarks. He believed that constant experimentation and the trial of new systems was necessary to progress in the art.

Mr. Stott disagreed with the conclusions of the author and cited the conditions of steam engineering as an illustration of what he meant. He said that when the New York Subway was built, the engineers ordered duplicates of the engines used in the Manhattan power station, and although these engines were built immediately after those in the Manhattan station, so many improvements had been made in the art that the subway engines were radically different in important constructional features. In view of this fact, after sixty years of development of the steam engine it seemed useless to consider an attempt to standardize electric locomotives now. The author, he said, was about half a century too early with his plea.

Mr. Thullen's paper was next read. This paper is published in abstract elsewhere in this issue. Mr. Stott supplemented the paper with a very full description of the fundamental principles of the block-signal system used in the New York Subway, which he said had a record of 300,000 performances to one failure. Mr. Waterman described some of the great difficulties which confronted the engineers who devised the subway signal system, and said that the Pennsylvania Railroad system had previously held the record for safety with 70,000 performances to one failure.

NEW YORK INTERBOROUGH AND PENNSYLVANIA RAILROAD INTERESTS COMBINE TO DIVIDE LONG ISLAND

On June 20, August Belmont, head of the Interborough Rapid Transit Company, entered into a contract with the Long Island Railroad Company—a system subsidiary to the Pennsylvania Railroad Company—for the joint ownership of the New York & Long Island Traction Company, which operates the most important trolley system in Nassau and Queens Counties. The contract was signed in behalf of the Interborough by Mr. Belmont, personally, and for the Long Island Railroad Company by Ralph Peters, the president. It is expected that the deal will have an effect upon the entire rapid transit situation in the Manhattan, the Bronx, Brooklyn and Queens Boroughs.

The Belmont interests already own the New York & Queens County Railway, from Long Island City to Flushing, College Point, Whitestone, Elmhurst, Jamaica and other points in Queens, and it is said this extensive system will be operated in connection with the New York & Long Island traction lines, making a big and comprehensive system of short-haul transit facilities in Queens and Nassau.

The new president of the New York & Long Island Traction Company will be Arthur Turnbull, now the Belmont president of the New York & Queens County Railway Company. F. L. Fuller, the present general manager of the New York & Queens lines, with offices in Long Island City, will manage the lines just acquired by the Interborough and Pennsylvania interests. The new directors of the New York & Long Island Traction Company are: August Belmont, representing the Interborough; Ralph Peters, representing the Pennsylvania-Long Island interests; E. P. Bryan, vice-president of the Interborough Rapid Transit; David C. Green, assistant secretary of the Long Island Railroad; General James Jourdan, director of the Interborough; A. L. Langdon, traffic manager for the Long Island Railroad; Alfred Skitt, director of the Interborough; C. L. Addison, general superintendent of the Long Island Railroad, and Arthur Turnbull, president of the Belmont trolley lines in Queens. Frank E. Haff will be secretary, and Jordan J. Rollins, treasurer.

This deal between the Interborough and Pennsylvania Companies is taken to mean that there will be an amicable working agreement as to traffic between the Long Island Railroad and the Belmont-Peters trolley lines. It also is said that there will be no further extensions of the trolley system which will tend to injure the long-haul business of the railroad company.

SECOND ANNUAL REPORT OF THE MONTREAL STREET RAILWAY MUTUAL BENEFIT ASSOCIATION SHOWS PROSPEROUS CONDITION

The second annual report of the Montreal Street Railway Mutual Benefit Association was submitted at the annual meeting held on Thursday, June 15, 1905. The amount of relief work done by the association during the fiscal year ended April 30, 1905, disclosed the following facts: Number of members disabled through sickness or injury, 611; number of prescriptions issued, 2864; number of visits made by physicians to disabled members, 692; number of consultations given by physicians to disabled members, 4026. Amount paid for sickness and injury, $6,239.10; amount paid for medicine, $783.73, and amount paid for death and burial insurance, $5,767.67.

The membership of the association has very largely increased within the past year, there being now 1700 members, and in order to accommodate and have the members properly looked after and cared for, the committee of management decided to increase the medical staff and open medical offices in the various divisions of the company's system. In the month of August last, a picnic under the auspices of the association was held at Riverside Park, and lasted for a period of six days. In spite of unfortunate weather conditions the financial results were satisfactory, netting a profit of $1,316.42. In the month of January a family reunion of the members of the association was held at the Monument National, by special invitation of the Montreal Street Railway.

The committee of management also acknowledged the special donation of $3000 received from the Montreal Street Railway Company on Dec. 24 last, this being in addition to the contributions agreed to under clauses 21 and 22 of the rules and by-laws, making the total contributions from the company $12,021.66. This amount, together with the fees and dues received from the members, viz., $8800, and the proceeds of the picnic and interest on bank deposits, amounting to $1,576.99, made a total revenue for the year of $22,398.65, and as the expenses were $18,850.41, a surplus of $3,548.24 was left.

ORGANIZATION OF THE DORNER MANUFACTURING COMPANY TO BUILD TRUCKS AND OTHER RAILWAY MATERIAL

A new company for the manufacture of electric railway trucks and other devices has recently been organized under the laws of Indiana, known as the Dorner Manufacturing Company, with headquarters at 1157 Monadnock Building, Chicago, and a factory at Logansport, Indiana. This is an entirely new company which has purchased the factory and patents of the old Dorner Truck & Foundry Company. The men behind the new company are prepared to go into business on a large scale, and the aim will be to produce superior products and execute contracts in a satisfactory and businesslike manner. The list of officers of the company is such as to inspire confidence that this will be done. The president of the company is Luther Allen, of Cleveland, Ohio. He is president and director in a number of large companies and is prominent in banking, manufacturing and railway circles in Cleveland. He is probably best known to electric railway men as president of the Toledo & Western Railway Company. The vice-president is Henry R. Adams, of Chicago. The secretary is Henry A. Dorner, of Chicago, a man of long practical experience and wide acquaintance in the street railway manufacturing business. He is the originator of the Dorner truck. Besides his manufacturing experience, he is well acquainted with the sales end of the business. The treasurer is Geo. H. Ford, of Chicago, formerly of Cleveland. These officers, together with Geo. A. Skinner, cashier of the Mt. Clemens Savings Bank, constitute the directors. Mr. Ford, the treasurer, was for fourteen years national bank examiner.

The factory is in the eastern part of Logansport, Ind., on the tracks of the Wabash Railroad, and the Indiana Union Traction Company. The buildings consist of a foundry, 50 x 115 ft., and a machine shop, 60 x 100 ft., connected by an office, 20 x 20 ft. The capacity of the machine shop is rated at 8 to 10 trucks per day. The foundry is equipped with a cupola with a capacity of 15 tons per hour. A new truck will soon be on the market in addition to the best of the products formerly made by the Dorner Truck & Foundry Company. These products include trucks, track cleaners, pit jacks, fenders, work cars, snow plows, castings, and general foundry work and electric railway repairs. Although most of the products will be the same, with the new ownership, it is intended to conduct the affairs of the concern in even a more businesslike manner than ever before and to spare no expense to make the products of the company second to none.

FINANCIAL INTELLIGENCE

WALL STREET, June 21, 1905.

The Money Market

The money market this week reflected to some extent the preparations making in connection with the July 1 interest and dividend disbursements. Time loans were firmer, and local lenders were not disposed to offer with much freedom, even at the higher rates. Sixty and ninety-day contracts were obtainable at 3 per cent, but for the longer periods asking rates ruled ¼ per cent higher at 3½ per cent for four months and 3¾ per cent for six months. The foreign houses again offered with some liberality, but there was no inclination on their part to shade the ruling quotations. The demand, however, was limited. Money on call was in abundant supply all week at rates ranging from 2½ to 2 per cent, the bulk of the business being transacted at about 2¼ per cent. Mercantile paper continued in good request, but the supply of choice material was extremely small. Rates were unchanged on the basis of 3¾ to 4 per cent for the best names. Sterling exchange was stronger, prime demand bills advancing 15 to 20 points to 4.87.20, despite the liberal offerings of finance bills. The rate, however, is still considerably below the gold export rate. The situation abroad was more favorable, especially at Paris, owing to the negotiations between France and Germany for a settlement of the Morocco controversy. Discount rates at the principal European centers were practically unchanged, as follows: London, 2 per cent; Paris, 1⅝ per cent; Berlin, 2⅜ per cent. The bank statement published last Saturday showed an increase in loans of $15,340,000, due, probably, to syndicate operations. The increase of $1,495,000 in cash was considerably more than indicated by the preliminary estimate. Deposits increased $16,452,000, thus increasing the reserve required by $4,113,000. The surplus decreased $2,618,000 to $7,209,500, against $38,000,000 in the corresponding period of 1904, $10,099,575 in 1903, $12,158,250 in 1902, $6,611,350 in 1901 and $15,526,850 in 1900. United States deposits decreased $133,300 to $12,598,400. At the close indications pointed to a continued steady market at about the present level of rates. Thus far this week the local banks have gained nearly $4,000,000 in cash, as a result of the increased pension payments and the return of funds from San Francisco. The first consignment of Klondike gold of the season, amounting to $400,000, was announced this week.

The Stock Market

Extreme dullness prevailed in the stock market this week, but apart from temporary reaction, due largely to realizing sales, the general tendency of prices was toward a higher level. At the beginning of the week the trading was practically lifeless, each day making low records so far as the volume of business was concerned. London was not a factor, and the demand for stocks from outside sources was extremely small. During the last half of the week, however, there was a decided change for the better. The prospects of an amicable settlement of the Morocco dispute between Germany and France, the favorable reports concerning the growing crops, and the continued increase in railway gross traffic returns imparted a decidedly better feeling. Commission house business increased considerably, and there was evidence that strong interests were in control of the market, resulting in generally higher prices. The bond market was less active but strong, the feature being the sharp advance in Japanese Government bonds, which established a new high record. The railroad stocks were generally strong under the lead of Reading, New York Central and Union Pacific. In the industrials, the United States Steel issues were in demand at materially higher prices. Other strong features were Illinois Central, Louisville & Nashville and Tennessee Coal & Iron.

The local tractions were active and strong, closing prices showing substantial net gains as compared with those prevailing at the close of last week.

Philadelphia

There was a material falling off in the dealings in the traction issues this week, and prices continued to show considerable irregularity. Interest was again centered in the speculative issues, and especially in Philadelphia Rapid Transit, the price of which was influenced almost entirely by the developments in the franchise question. In the early dealings the price broke sharply on the publication of the announcement that the street railway committee of the Council had decided to report favorably the repeal ordinance, along the lines of the decision handed down by the City Solicitor, which was adverse to the company. Subsequently, however, there was a sharp advance to 27⅜, on buying based on the belief that, as the company had already paid a year's franchise tax, it is now legally in full possession of the streets in question. The closing was at 27¼, a gain of ¼ for the week. Upwards of 13,000 shares were dealt in. United Gas & Improvement was considerably less animated and weak. From 94¾ at the opening the price receded to 91 on fresh liquidation by important political holders. At the close there was a recovery to 93, which figure represents a loss of 2 per cent. Less than 10,000 shares were dealt in, as against more than 30,000 shares in the preceding week. Philadelphia Company common was fairly active, upwards of 2500 shares changing hands at prices ranging from 42¼ to 42½, a loss of ¾, while several hundred shares of the preferred were dealt in at from 47½ to 40¾, a decline of ¾. Philadelphia Traction was firm, about 100 shares in small amounts selling at 99½. Union Traction lost ½, about 600 shares selling at prices ranging from 59¾ to 59 and back to 59¼. Other transactions included United Companies of New Jersey at 272 to 271½, American Railways at 50⅞ to 51, and Consolidated Traction of New Jersey at 82⅝ to 82½.

Chicago

Trading in this market was more animated this week, and prices generally held strong. The feature was an advance in Metropolitan Elevated preferred of 1¾ points to 67½ on the exchange of 675 shares. The common sold at 24½ for 45 shares. The strength exhibited in the preferred stock was based upon the increased business of the company, and the belief in certain quarters that progress is being made in the plans looking to the consolidation of the various elevated properties. North Chicago Street Railway opened at 65, but later, on the sale of 50 shares, the price dropped to 62, the lowest price at which the stock has ever sold. Subsequently there was a full recovery. In all 170 shares were traded in. West Chicago sold at from 41½ to 42½ for small amounts. Other transactions included Chicago & Oak Park Elevated at 20½ to 21, Northwestern Elevated common at from 22 to 23 and the preferred at from 62½ to 63, and South Side Elevated at 95⅛.

Other Traction Securities

The feature of the Baltimore market was the activity in United Railway incomes, nearly $300,000 of which were dealt in. In the early dealings there was heavy buying at 62¾, on the report that the back coupons would be paid, but on subsequent denials from official sources, the price ran off sharply to 59. Near the close, however, there was a sharp upward movement which lifted the price to 62⅛. Some large blocks of the bonds came out on the advance. The closing sale was made at 62. The 4 per cent bonds were quiet but strong throughout, about $20,000 selling at from 93¼ to 94. Trust certificates for $2,000 incomes sold at 61½, and trust certificates for the stock sold at 14. The free stock brought 13½ to 13⅛. Other transactions included $5,000 Macon Railway & Light 5s at 99, $6,000 Norfolk Railway & Light 5s at 92¼ to 92, and $1,000 Atlanta Street Railway 5s at 107½.

The Boston market was quiet, the feature being the sharp fluctuations in Massachusetts Electric issues. The common, after selling at 18½ at the opening broke to 17½, but later advanced to 19¾ and closed within ½ of the highest. The preferred declined from 60½ to 59, but ended the week at 62¼, an advance of over 3 points. Boston Elevated held firm at 157. Boston & Suburban preferred fluctuated between 69 and 70, closing at the highest, while the common rose from 20 to 21½ and ended the week at 21¼. Other transactions included West End common at from 97⅜ to 98⅛, the preferred at 117 to 116½; Boston & Worcester common at 29 to 29¾ and 29½, and the preferred at 77½ and 77¾. In the New York curb market Interborough Rapid Transit ruled extremely quiet but steady. About 700 shares sold at prices ranging from 202½ to 201⅛, closing at 202. New Orleans Railway stocks were less active and irregular, the common losing ½ point to 27¾, while the preferred made a new high record at 81 and closing near the highest. The 4½ per cents were strong, $46,000 changing hands at 90⅝ to 91. Jersey

City, Hoboken & Paterson 4s sold to the extent of $70,000 at from 76½ to 76. United Electric of New Jersey 4s brought 74½ to 74 and interest for $30,000. Public Service 5 per cent notes sold at 97¾ for $10,000, and $30,000 certificates brought 69 flat. The stock sold at 112 for 200 shares.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks and the active bonds, as compared with last week:

	June 14	June 21
American Railways	50	50
Boston Elevated	156	156
Brooklyn Rapid Transit	64	65⅞
Chicago City	—	a190
Chicago Union Traction (common)	5⅞	6⅛
Chicago Union Traction (preferred)	—	32
Cleveland Electric	79⅝	79½
Consolidated Traction of New Jersey	82	82
Consolidated Traction of New Jersey 5s	108½	108½
Detroit United	91¼	92½
Interborough Rapid Transit	*201	201¼
International Traction of Buffalo	25	25
International Traction of Buffalo (preferred)	60	63
International Traction of Buffalo 4s	82½	—
Manhattan Railway	163	164
Massachusetts Electric Cos. (common)	17	19¼
Massachusetts Electric Cos. (preferred)	58	62
Metropolitan Elevated, Chicago (common)	23½	24½
Metropolitan Elevated, Chicago (preferred)	64½	66
Metropolitan Street	122⅞	125¼
Metropolitan Securities	79¾	81⅛
New Orleans Railways (common), W. I	38¼	38
New Orleans Railways (preferred), W. I	80	80¼
New Orleans Railways 4½s	90¼	90½
North American	97½	99
North Jersey Street Railway	25	25
Philadelphia Company (common)	42½	42½
Philadelphia Rapid Transit	26¾	26¾
Philadelphia Traction	99½	99½
Public Service Corporation 5 per cent notes	97	97
Public Service Corporation certificates	69	69
South Side Elevated (Chicago)	94½	93½
Third Avenue	127	128
Twin City, Minneapolis (common)	109¾	110½
Union Traction (Philadelphia)	*59¾	59½
West End (common)	97	97½
West End (preferred)	116½	116½

a Asked. W. I., when issued. * Ex-dividend.

Iron and Steel

The "Iron Age" says new business has been rather light in nearly all branches of the iron and steel trades, and in some of them what is virtually a deadlock between buyers and sellers continues. Sentiment, however, is rather improved, although there is little that is tangible in the way of new orders to justify it. In pig-iron, there come reports from some distributing markets that inquiries are a little more numerous, but the tonnage being placed is light and buyers are securing some concessions in prices. The only interesting item in the rail trade is the report that the Tennessee Coal & Iron Company has taken orders aggregating 55,000 tons for 1906 delivery.

REORGANIZATION PLANS FOR EASTERN OHIO TRACTION COMPANY

A committee on reorganization has submitted to the security holders of the Eastern Ohio Traction Company, a plan for reorganizing the company and taking it out of the receiver's hands, where it has been the past year. The plan provides for the formation of a new company to be known as the Cleveland & Mahoning Valley Traction Company, which will have a capital stock of $3,000,000, of which $1,000,000 will be 5 per cent preferred stock. After providing for underlying securities and paying off the floating debt of $300,000, it is stated that the company will have $878,000 in new money which will be used in building an extension from Garrettsville to Leavittsburg, thereby giving through connection from Cleveland to Youngstown, also in building a new power station. The plan amounts to an assessment of about $39 a share on the stock of the company. It is understood that the leading stockholders think favorably of the plan, and with the new through connection it is believed the earnings of the road will show marked gains.

ROCHESTER & EASTERN SOLD TO NEW YORK CENTRAL

On Wednesday of last week the Rochester & Eastern Rapid Railway, of Rochester, N. Y., was sold to New York Central Railroad interests. This has given rise to the publication in Rochester papers of stories to the effect that the Rochester Railway Company, operating the city lines, also has been sold. The Rochester Railway is controlled by the Clark interests of Philadelphia. They have denied the sale of the property. From interests identified with the New York Central the STREET RAILWAY JOURNAL learns that the Central has not purchased the Rochester system.

MONTEREY SYSTEM TO BE EXTENDED

M. V. McQuigg, of the Monterey County Gas & Electric Company, says that the proposed extension of its Monterey Electric Railway, from Pacific Grove to Carmel-by-the-Sea, will be constructed this winter. Materials and equipment will be called for in the near future. The road will parallel the 17-mile drive, following the shore line, and will be about 11 miles in length. It will be necessary to increase the equipment of the company's electric power plant at Monterey in order to operate this extension and the 18-mile electric road from Monterey to Salinas, which is to be built next year. Mr. McQuigg says that within a few years all of the towns in the Monterey Bay region will be connected with San Francisco by electric railways. The Union Traction Company, which controls all of the lines at Santa Cruz, is building a mile of electric road extension from Capitola to Soquel. A five-mile extension, running out Pacific Avenue, at Santa Cruz, will be constructed to the Big Trees. All of the Union Traction Company's narrow-gage lines will be rebuilt next year as standard-gage roads with heavy rails and equipment.

HUDSON VALLEY RAILWAY CHANGE IN OWNERSHIP

After a meeting of the directors of the Merchant's Trust Company on June 19, it was announced that the offer which the Colvin syndicate made for the securities of the Hudson Valley Railway held by the trust company as collateral, and as investments had been renewed and accepted. The amount offered for the securities was $850,000, as before. This, with $350,000 cash on hand, $500,000 in New York City bonds, and $300,000 which some of the directors will put up on the securities of the Rutland public service companies, will enable depositors to be paid off in full as soon as the approval of the court is obtained for the settlement.

The directors intend, when the payment of depositors has been arranged, to apply for an order directing the receivers, Otto T. Bannard and Douglas Robinson, to turn over the Rutland and other securities to a committee to be named by the stockholders and approved by the court, with power to market them as best they can. It is hoped that enough will be realized on these securities to bring the stockholders out without loss.

At the stipulation of the Attorney General, the charges that illegal loans were made by the trust company, and that deposits were accepted after the company was insolvent, have been stricken out of the complaint in the receivership suit, which is being heard at Hudson. In place there have been inserted simply allegations that on May 23, the company was unable to pay its debts. Further action in the receivership case was postponed on June 17 for one week, to enable the directors to do what they could to straighten matters out.

STATE COMMISSIONER MUST APPROVE PLANS IN PENNSYLVANIA

Thomas E. O'Connell, who has built a number of electric railways in the vicinity of Westchester, has received word from the State Commissioner of Highways, at Harrisburg, that, hereafter, no electric railway can be built upon any state improved road until the plans for such construction shall have been approved by the State Commissioner. It is understood that these notices are being sent to all electric railway companies in the State. It will not affect any electric railways in Chester County just at present, but may affect a number of contemplated extensions. In New Jersey, where the State also improves the public highways, no such rule has been laid down, but it is necessary to secure the consent of the board of freeholders (same as county commissioners in Pennsylvania) in the county through which the highway passes. To cross the same, with a steam railroad charter, in New Jersey, requires no consent, so long as the grade is not changed. No change in grade can be made there without the State Road Commissioner's consent.

SOME OF THE EXHIBITS AT THE MANHATTAN BEACH CONVENTION OF THE AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION AND THE MASTER CAR BUILDERS' ASSOCIATION

The convention of the American Railway Master Mechanics' Association held at Manhattan Beach, N. Y., June 14, 15 and 16, and that of the Master Car Builders' Association held at the same place June 19, 20 and 21, were largely attended and received as well the hearty co-operation of a large number of manufacturers of railway supplies. One side of the spacious veranda of the Oriental Hotel proved entirely inadequate, even for all of the smaller exhibits, making it necessary to place the major portion of the exhibit on the grounds behind the hotel. Part of the railway track was also utilized for display purposes. The following list comprises the greater part of those of electric railway interest.

The Consolidated Car Heating Company, of Albany, exhibited its steam and electric car heaters, couplers, valves, fittings and switches, and had a complete outfit of the McElroy automatic lighting system in operation.

The Franklin Railway Supply Company, of Franklin, Pa., had an extensive exhibit of lubricators, journal boxes, flexible metal conduits and couplers.

The General Electric Company, of Schenectady, N. Y., was represented at the convention and had on exhibition its block-signal system, views of the New York Central locomotive, Curtis turbines and air-brake compressors. The mercury arc rectifier made by the company was also one of the principal attractions in its booth.

Heywood Brothers & Wakefield Company, of Wakefield, Mass., attracted attention to its exhibit of car seats for steam and electric cars and a model of its car-seat mechanism.

The Pittsburg Spring & Steel Company showed a full line of springs from those used on locomotives down to those employed on governor valves.

The Rushmore Dynamo Works, of Plainfield, N. J., had an interesting exhibit on the hotel veranda, comprising several types of the Rushmore lens miror searchlight.

The exhibit of the Coe Brass Manufacturing Company, while not elaborate, was an object of considerable attention, owing to the presence of a large number of sections of the company's new extruded metal.

C. H. Besly & Company, of Chicago, were on hand with an exhibit of Gardner grinders, Helmet temper taps and other specialties.

The Crandall Packing Company had a varied assortment of its high-pressure ring and coil packing and waterproof hydraulic ring and spiral packing.

L. C. Chase & Company, of Boston, New York and Chicago, were on hand with various styles of plush for car seating.

A remarkable proof of the growing use of carborundum for various railway purposes was evident from the exhibit of the Carborundum Company, of Niagara Falls. Oil stones were especially prominent.

The Baldwin Locomotive Works had a four-cylinder balanced compound locomotive on the Long Island Railroad tracks near the hotel.

The Federal Manufacturing Company, of Elyria, Ohio, had an interesting exhibit of Keeler car curtains.

A large number of bolster castings was shown by Benjamin Atha & Company, of Newark, N. J.

The Philip Carey Manufacturing Company had a large booth in which it showed an extended line of magnesia packings, steam pipe and boiler coverings and various asbestos materials.

Steel-backed brake shoes of various types were shown by the American Brake Shoe & Foundry Company, of Rahway, N. J.

The Adams & Westlake Company, of Chicago, represented the Newbold system of electric train lighting, signal lamps and car trimmings.

Couplers for freight, passenger and engine service were exhibited by the Washburn Company, of Minneapolis.

One of the most striking exhibits was the elaborate line of car disinfectants made by the West Disinfecting Company, of New York.

The advantages of the belting compound made by the Cling Surface Company, of Buffalo, N. Y., were demonstrated by a belt in operation on the ground.

The Yale & Towne Company had two exhibits, one on the hotel veranda comprising a large assortment of locks and other hardware for railway use, and another in a booth on the grounds showing its hoists.

The Booth Water Softener Company, of New York, had a large model of its water softener in constant service.

Among the exhibits of the Sprague Electric Company were its latest designs of flexible metallic conduit and armored cable.

A comprehensive variety of railway lamps and headlights was presented by the Dressel Railway Lamp Company.

The ease and effectiveness secured by the vacuum method of cleaning carpets and similar materials was made evident by watching the working exhibit of the Vacuum Cleaner Company, of New York.

The American Steel Foundries and Simplex Railway Appliances Company had on exhibit numerous car castings. There was also shown a number of Bettendorf trucks.

Some very fine specimens of railway springs were on view in the quarters of the Pittsburg Spring & Steel Company.

In the exhibit of the Acme White Lead & Color Works, of Detroit, the main attraction was Pandect, the latest development by this company in rust prevention paints.

The following wood-working machine tools were among those shown by the Oliver Machinery Company, of Grand Rapids, Mich., a universal double-arbor saw bench; three types of band saws; two styles of hand planers and jointers, and one 88-in. combination cap fit and center lathe.

A complete belt conveyor ready for service was the attraction offered by the Robins Conveying Belt Company, New York.

The Westinghouse Traction Brake Company, the Westinghouse Automatic Air & Steam Coupler Company, the Westinghouse Air Brake Company and the American Brake Company had in common a handsome booth in which were placed working models of the products made by the companies mentioned.

The Gould interests also had a special booth on the grounds, the exhibit of the Gould Storage Battery Company comprising railroad types of storage batteries, and that of the Gould Coupler Company embracing friction draft gear in service, freight couplers, etc. The Gould electric car lighting system was also in evidence.

Several types of wheels and brake shoes as applied to them were presented by the Wheel Truing Brake Shoe Company, of Detroit, Mich.

On a large platform the Gold Car Heating Company laid out a complete model of its system of steam piping for car heating.

The Goldschmidt Thermit Company had its headquarters in a small tent, where it gave away memorandum books as souvenirs. Demonstrations of thermit welding were given at 4 p. m. every day.

The Pitt Balance Door Company, of New York, had a full-sized working model of its new balanced door which, on account of its compactness and ease in working, excited a great deal of interest and admiration among all those who tried it.

Pneumatic drills, hammers, stone tools, motor hoists, etc., were shown by the Rand Drill Company, New York.

The Buda Foundry & Manufacturing Company and Paige Iron Works showed jacks, brake shoes and other railway specialties including their new bearing metals.

Among the novelties shown at the convention was the rocker side-bearing truck designed by Gustav Lindenthal.

The Chicago Pneumatic Tool Company had an elaborate display of pneumatic tools of all kinds.

The large booth occupied by the Dearborn Drug & Chemical Works was devoted to an exhibit of chemicals for treating boiler feed-water. This company also gave away an interesting pamphlet on this subject.

Jenkins Brothers had a special booth on the grounds where they presented numerous specimens of their brass valves.

A. O. Norton, of Boston, Mass., had an exhibit of his railway jacks on a large table on the hotel veranda.

The sash fixtures made by the O. M. Edwards Company, of Syracuse N. Y., were not only shown in a special exhibit made by that company, but were also in evidence in the exhibits of other manufacturer of car furnishings.

The National Lock Washer Company, of Newark, N. J., presented a line of its car curtain fixtures, sash balances, nut locks, etc.

One of the most instructive exhibits was that made by the H. W. Johns-Manville Company, comprising an extended variety of asbestos and magnesia railway supplies on a counter made of transite fireproof board. Other manufactures shown were asbestos cement felting and fire extinguishers.

The Celluloid Company, of New York, had an exhibit of railroad cross-seat and chairs covered with its coach-seat covering known as "Texoderm."

Pamphlets on locomotive cranes and clam-shell buckets for handling coal were distributed by the Browning Engineering Company, of Cleveland, Ohio.

Recording gages for all purposes, and other steam specialties were to be seen in the section occupied by the American Steam Gage & Valve Manufacturing Company, of Boston.

The spiral nut lock, which locks both the bolt and nut absolutely, was shown by the Spiral Nut Lock Company, of New York.

Safety treads for car steps, stair and other places, were presented by the Universal Safety Tread Company, of New York.

An exhibit that attracted considerable attention was that of the Electro-Dynamic Company, of Bayonne, N. J. A number of its inter-pole motors were shown, both assembled and in parts. Besides this display, which was located in the Manhattan Beach railroad station, the company made its presence generally known by distributing descriptive catalogues throughout the grounds.

J. H. Williams & Company, of Brooklyn, were also represented at the convention and extended an invitation to the delegates to visit their drop-forging plant of the company.

The Western Tube Company, of Kewanee, Ill., presented an exhibit of the "Famous" Kewanee unions.

The Hale & Kilburn Manufacturing Company had a very fine exhibit of its seats covered with rattan, plush or leather.

Car curtains and curtain materials including the Forsyth roller-tip fixture, were on view in the section taken by the Curtain Supply Company, of Chicago.

On the veranda and opposite the Hale & Kilburn Company the Pantasote Company, of New York, showed a number of curtains in service made of the material manufactured by this company.

Pressure gages, air-brake gages, pressure-gage testers, etc., were among the devices exhibited by the Crosby Steam Gage & Valve Company.

An interesting exhibit was that made by the Standard Paint Company, of New York, which showed a number of minature buildings covered with "Ruberoid" roofing as well as samples of other materials treated with this paint.

Carborundum safety treads were shown in various styles by the Empire Safety Tread Company, of Brooklyn, N. Y.

The National Car Coupler Company, of Chicago, Ill., showed a number of minature trucks equipped with its couplers.

The Schoen Steel Wheel Company, of Philadelphia, took an active part in the exhibit by displaying a number of specimens of its pressed and rolled-steel wheels for railway service.

The St. Louis Car Company made an exhibit of spiral journal bearings.

The T. H. Symington Company, of Baltimore, Md., had on exhibition center and side ball-bearings for cars as well as journal boxes.

The Walworth Manufacturing Company had an extensive exhibit of pipe tools, wrenches, track drills and injectors.

THE GANZ TRACTION SYSTEM IN AMERICA

A new company called the Railway Electric Power Company, and located at 114 Liberty Street, New York, has been organized to exploit the three-phase traction and other patents of Ganz & Company, of Budapest. These rights, etc., cover the United States, Mexico, Cuba and all the West Indies other than those under British supremacy. The board of directors of the company is composed of John E. Borne, president of the Colonial Trust Company; William L. Bull, of Edward Sweet & Company; Henry Seligman, of J. & W. Seligman & Company; Stephen Peabody; H. R. Duval, of the Atchison, Topeka & Santa Fe Railroad; Leopold Wallach, of Wallach & Cook; Henry L. Sprague, of Stetson, Jennings & Russell; Gustav Lindenthal, former commissioner of bridges, and Gustave Leve.

L. B. Stillwell, electrical director of the Interborough Rapid Transit Company, and Frank N. Waterman are the consulting electrical engineers.

Director Leve says: "The huge initial cost of converting steam railroads, on this side of the Atlantic, has been a veritable stumbling block to the various managements considering change of motive power. The installation of the three-phase system costs about 40 per cent less than that of direct current, which is the prevailing mode of electric traction so far installed by the large American electrical companies. Another important claim made for the three-phase system is that it is the only method which provides for recuperation of power on down grades. In other words the power usually wasted in braking and in coasting down grades is by this system returned to the line as useful energy for handling other trains. It furthermore saves the wear and tear in rails, brake-shoes, wheel-tires, caused by mechanical braking. The most striking illustration of the three-phase system is the 65-mile Valtellina line of the Italian State Railway, which has been inspected by electrical engineering experts from all over the world. The operating cost has been reduced by upwards of 50 per cent over steam locomotive operation, which was formerly the power used. The Ganz people have lately perfected the three-phase system so that if necessary three-phase equipment can be run over lines already installed with direct or single-phase current. Negotiations are already under way with one of the big trunk lines looking toward the conversion of part of its road into electric motive power."

EXTENSIONS OF J. G. WHITE & COMPANY

J. G. White & Company announce that Eugene Lentilhon, C. E., for the past several years a contracting engineer in New York City, has become associated with them, and is now on his way to Chili on a mission covering the investigation of a number of important engineering projects. Mr. Lentilhon is a graduate of the Sheffield Scientific School, Yale University, and, for several years following his graduation, was in the service of the Dock Department in New York City. His most important work in this direction was his supervision as assistant engineer of improvements and repairs on the North River from the Battery to Fourteenth Street. In 1897 Mr. Lentilhon resigned from the Dock Department to engage in business as a contracting engineer. Among the principal contracts completed by him were the construction of the Hudson Park, New York City; the erection of two buildings for the New York Navy Yard; the removal of the reservoir from the site on Fifth Avenue between Fortieth and Forty-Second Streets, New York City; and the building of the foundations for the New York Public Library. J. G. White & Company have also secured the services as construction manager of G. R. Wadsworth, formerly of the New York Central Railroad. Mr. Wadsworth was born in 1875, and in 1898 graduated from the Massachusetts Institute of Technology in Civil Engineering. He entered the employ of the New York Central Railroad at Albany, being assigned to the office of division engineer, in which he worked in various capacities, ultimately being appointed assistant engineer. In 1901 he was transferred to the general offices in New York on special work under the engineer of track. Shortly afterwards he was made resident engineer of the middle district at Albany, in charge of construction work. In 1902 Mr. Wadsworth was appointed designing engineer of the company, with headquarters at the Grand Central Station. Here he had the supervision of plans and estimates for bridge masonry, culverts, piers, bulkheads and yard and shop layouts. In 1903 he was placed on the New York terminal improvement as assistant engineer, having charge of the construction of the "Port Morris Branch Depression" in the Bronx, the "Marble Hill Cut-Off" in upper Manhattan, and general improvements in four-tracking. Early in 1905 Mr. Wadsworth was appointed resident engineer of the Hudson district, in charge of contract work connected with the terminal improvements from Mott Haven to Croton.

INSTRUCTION IN ELECTRIC TRANSPORTATION

The Polytechnic Institute of Brooklyn announces a series of evening courses in electric transportation, consisting of fourteen two-hour lectures. The lectures, which will be given on the dates mentioned, are as follows:

Oct. 10. "How to Route the Line and Determine the Most Suitable Service," by H. A. Lardner, of J. G. White & Company.

Oct. 24. "Legal Points as to Franchises, Organization, Eminent Domain and Liability," by R. Burnham Moffat, member of the New York Bar.

Nov. 8. "Influence of Traffic Conditions on Motor Specifications," by A. H. Armstrong, of the General Electric Company.

Nov. 21. "How to Select the Proper Motor Equipment," by Mr. Armstrong.

Dec. 5. "How to Design the Sub-Stations and Low-Potential Distributing System," by Mr. Armstrong.

Dec. 19. "How and Where to Substitute Electricity for Steam," by Mr. Armstrong.

Jan. 16. "Where to Locate the Power House," by W. S. Barstow.

Jan. 30. "How to Develop a Water Power," by F. A. C. Perrine.

Feb. 13. "How to Design the Power House," by H. G. Stott, superintendent of motive power, Interborough Rapid Transit Company.

Feb. 27. "How to Organize the Operating Force of the Power House," by Mr. Stott.

March 13. "How to Purchase Fuel," by Mr. Stott.

March 27. "How to Light Ordinary Pullman Cars by Electricity," by W. L. Bliss, of the Bliss Electric Car Lighting Company.

April 10. "Maintenance of Electrical Equipment and Rolling Stock," by J .S. Doyle, superintendent of car equipment, Interborough Rapid Transit Company.

April 24. "How to Operate the Complete Plant," by J. F. Calderwood, vice-president and general manager of the Brooklyn Rapid Transit Company.

In addition, C. O. Mailloux will give a series of fifteen lectures on "Electric Train Movement," and Dr. Samuel Sheldon fifteen two-hour lectures on "Alternating Currents." Students taking the transportation course can also engage in car testing under Professor Ashe.

THE PUBLIC SERVICE CORPORATION OF NEW JERSEY PLAN TO BUILD NEW YORK-NEWARK SUBWAY

A rapid transit electric line from the heart of Newark to the heart of Manhattan, with trains running practically all the way underground, is to be a fact of the near future, according to a statement made on June 20 by Thomas N. McCarter, president of the Public Service Corporation. Mr. McCarter does not say just how the line will cross the Hudson, but it is believed it will run through the McAdoo tunnel. The Newark terminal is to be in the square bounded by Park Place, East Park Street, Pine Street and Canal Street, where recently Mr. McCarter and his brother Uzal made extensive purchases of property. In his statement Mr. McCarter says:

"The road will be built with the finest electrical construction. There will be no grade crossings; within the limits of the city of Newark it will be a sub-surface road; the Passaic River will be tunneled; it has not yet been determined whether to tunnel or bridge the Hackensack River. The route through Jersey City will be in part elevated and in part below grade.

"The plan as outlined provides a more direct and far better entrance into the city of Newark than would have been the case had the road been built on the bed of the Morris Canal. If the canal should ever be abandoned as a waterway and become available for railroad purposes it will be practicable to make a sub-surface connection between the new line and the bed of the canal at or near Broad Street, in which case the line could be extended west as far as desirable. Such an extension, however, is only incidental to the plan we have outlined, the consummation of which has been determined upon without reference to canal abandonment."

Already the route of the proposed line has been surveyed and considerable real estate purchased. It is probable the Manhattan terminal will be in the neighborhood of Tenth and Hudson Streets.

SUBWAY DANGERS

The "New York Sun," of June 16, publishes a letter from Nicola Tesla, on dangers in the subway. Mr. Tesla writes:

"It is to be regretted that this important pioneering enterprise, in other respects ably managed and engineered, should have been treated with such gross neglect in its most vital feature. No opportunity was given to myself, the inventor and patentee of the system adopted in the subway and the elevated roads, for offering some useful suggestion, nor was a single electrician or engineer of the General Electric and Westinghouse Companies consulted, the very men who should have been thought of first of all.

"The danger to which I refer lies in the possibility of generating an explosive mixture by electrolytic decomposition and thermic dissociation of the water through the direct currents used in the operation of the cars. Such a process might go on for hours and days without being noticed; and with currents of this kind it is scarcely practicable to avoid it altogether.

"It will be recalled that an expert found the percentage of free oxygen in the subway appreciably above that which might reasonably have been expected in such a more or less stagnated channel. I have never doubted the correctness of that analysis, and have assumed that oxygen is being continuously set free by stray currents passing through the moist ground. The total amperage of the normal working current in the tunnel is very great, and in case of flooding would be sufficient to generate not far from 100 cubic feet of hydrogen per minute. Inasmuch, however, as in railway operation the fuses must be set hard, in order to avoid frequent interruption of the service by their blowing out, in such an emergency the current would be of much greater volume and hydrogen would be more abundantly liberated.

"It is a peculiar property of this gas that it is capable of exploding when mixed with a comparatively large volume of air, and any engineer can convince himself by a simple calculation that, say, 100,000 cubic feet of explosive might be formed before the danger is discovered, reported and preventive measures taken. What the effect of such an explosion might be on life and property is not pleasant to contemplate. True, such a disaster is not probable, but the present electrical equipment makes it possible, and this possibility should be, by all means, removed.

"The oppressiveness of the tunnel atmosphere is in a large measure due to the heat supplied by the currents, and to the production of nitrous acid in the arcs, which is enhanced by rarefaction of the air through rapid motion. Some provision for ventilation is imperative. But ventilation will not do away with the danger I have pointed out. It can be completely avoided only by discarding the direct current.

"I should say that the city authorities, for this if for no other reason, should forbid its use by a proper act of legislation. Meanwhile, the owners of adjacent property should object to its employment, and the insurance companies should refuse the grant of policies on such property except on terms which it may please them to make."

B. R. T. BANDMASTER AND BAND SURPRISED

The members of the Brooklyn Rapid Transit Employees Association Band, composed of thirty employees of the Brooklyn Rapid Transit Company, which is under the leadership of W. S. Mygrant, of the Thirteenth Regiment, N. G., N. Y., met for the regular weekly rehearsal Thursday evening, June 15, at the association club rooms in East New York. Instead of rehearsing in the class room on the second floor of the building, as is their usual custom, the band gave a regular programme of selections, drawn up on the gymnasium floor, which opens into the concert and lecture hall. The regular class room this time was devoted to another purpose. Why it was that a change had been made was evident after the band had finished its programme. The members learned that the ladies interested in the work of the organization had prepared a luncheon for them, and that other things also were in store.

On behalf of the organization, Vice-President Wolfram, who is superintendent of the Brooklyn Bridge division, made a speech, in which he acknowledged the debt of the organization to Mr. Mygrant. He said that by his painstaking efforts and sacrifices of a purely personal nature he had built up in Brooklyn an organization the like of which does not exist outside of that city, and that he felt Mr. Mygrant's efforts should be fittingly recognized. Then, on behalf of the board of trustees of the association, he presented to Mr. Mygrant a handsome gold medal, inscribed on its face in raised letters and fittingly engraved on the reverse side with the inscription, "Presented by the Brooklyn Rapid Transit Employees' Association, June 15, 1905."

Mr. Mygrant replied briefly, thanking the association for the remembrance, and then said a few words to his pupils. He acknowledged their part in the success that had been achieved by the organization and said the prospects for the future were that the street railway men soon would have an organization that would rank with any other in the borough.

Mr. Wolfram then took the floor to acknowledge the debt of the association to the members of the band individually and to present to them as a body a handsome silk banner, the work of Mrs. George W. Edwards and Mrs. Wolfram. This banner is in maroon and gold, the standard colors of the Brooklyn Rapid Transit Company. It is inscribed with the words "The Brooklyn Rapid Transit Employees' Association Band," done in gold and black on maroon. Mr. Mygrant accepted the banner in behalf of the band, the members cheering the ladies.

The ladies to whom the credit of management is due are Mrs. George W. Edwards, Mrs. G. F. Wolfram, Mrs. Mygrant, Miss Ida B. Homan and Miss Olive Edwards and Miss May Louise Mygrant.

NEW CARS FOR DES MOINES

The Des Moines City Railway Company has made arrangements to add thirty-seven new cars to its equipment during the present season. Twenty-three of these have been ordered from the St. Louis Car Company. The first two have already been received and placed in service, and the other twenty-one are to be delivered within thirty days. Four cars are now being constructed in the company's own shops, and will be completed within the next few days. The company has also given orders for the construction of ten more cars in its shops, which are to be completed and ready for operation by fall. All the thirty-seven cars are to be double-truck and double motor cars, capable of carrying full loads up the steepest grades on the system. Each will have a seating capacity of sixty passengers. The cars are not to be provided with smoking compartments, but will have a small rear-end vestibule for entrance purposes. It is the intention to have a 7-minute service on the Sixth Avenue and West Ninth Street lines, when the work of double tracking said lines is completed. The half-hour service on Fourth Street will be reduced to 15-minute service. A 10-minute service will be put in operation on the Ingersoll Park line regularly and a 3-minute service during the rush hours. The 20-minute service on the Walker Street line will be reduced to 15 minutes, and the Union Park service will be materially reduced in time. It is also the intention to put an express service on the University and Fair Ground lines; that is, the company contemplates running cars out from the city that will make stops to receive and discharge passengers for districts beyond Nineteenth Street on the University line and beyond Fourteenth Street on the Fair Ground line.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED JUNE 13, 1905

792,025. Means for Protecting Electric Circuits; John Hamilton, Jr., Boston, Mass. App. filed Oct. 16, 1903. Means for notifying a central station of current leakage from the conductor via water and gas mains, etc., consisting of an alarm circuit closer adapted to be actuated by an excessive difference of potential between the ground terminal of the generator and a point on the water or gas mains.

792,122. System for Transmitting Electric Currents to Cars; John J. Eagan, San Francisco, Cal. App. filed Feb. 2, 1905. The car has two trolley poles, one at each end thereof between the outer ends of which a wire is stretched for connection with conductor-plates mounted upon a plurality of equidistant poles at the side of the roadway.

792,157. Anti-Friction Side-Bearing for Railway Cars; John F. O'Connor, Chicago, Ill. App. filed April 6, 1905. Consists of a hollow rocker or cradle, a hub having an external curved bearing-face, and rollers between the hub and cradle.

792,174. Electric Railway Switch-Operating Device; Charles W. Squires, Springfield, Mass. App. filed May 16, 1904. The switch-point is actuated by solenoids which are energized through circuits controlled by an alternately moving switch, which switch has oppositely inclined cam surfaces so disposed that it is thrown in opposite directions by successive movements of its operating magnet.

792,397. Switch Throwing Mechanism; Michael F. Burkhart, West Newton, Pa. App. filed Feb. 4, 1905. A pair of pivoted switch tongues connected together by a bar are adapted to be thrown through a system of levers when actuating pins are engaged by an approaching car. Locking and unlocking means are also provided for the switch.

792,465. Car Wheel; Charles T. Schoen, Philadelphia, Pa. App. filed Feb. 28, 1905. A wrought car wheel having a reduced web, a bent tread and an upset flange of relatively greater thickness than the web, the web, tread and flange being integral.

792,470. Sander; Samuel T. Simmons and Walter T. Moore, Columbus, Ohio. App. filed Jan. 5, 1905. Details of construction.

792,482. Car Truck; John C. Wands, St. Louis, Mo. App. filed March 25, 1904. Provides an anti-friction support whereby the car is carried at its corners instead of at its center.

792,569. Electric Railway; William Chapman and Percy W. Davies, Pittsburg, Pa. App. filed Nov. 23, 1897. Relates to that class of railways in which the conductor is made up of normally dead sections. As the collector shoes passes from one section to another it forms a bridge which establishes a circuit for energizing the succeeding section from the section previosuly energized, and so progresses through the entire line.

PERSONAL MENTION

MR. RICHARD M'CULLOCH, of the United Railways of St. Louis, was awarded the honorary degree of M. A. at the commencement exercises on June 15, of Washington University at St. Louis.

MR. JOHN B. PARSONS, president of the Philadelphia Rapid Transit Company, will head the local committee at Philadelphia of the American Street Railway Association, as chairman of the committee.

MR. HARRY L. WEBBER has resigned as city civil engineer to accept the position of chief engineer of the Ft. Wayne & Wabash Valley Traction Company, which operates between Ft. Wayne and Logansport, and is building on to Lafayette.

THE MARRIAGE OF MR. C. P. WRIGHT, general manager of the Standard Brake Shoe Company, Aurora, Ill., to Miss Ada H. Allen, will occur June 27. After the ceremony Mr. and Mrs. Wright will go to Denver, Col., returning to Aurora, Ill., about July 15.

MR. WILLIAM BUSBY has been appointed general manager of the Indian Territory Traction Company. The application for a receiver filed in the court by the minority stockholders will likely be withdrawn. Mr. Busby was selected by both factions of the Chicago capitalists, who own the system.

MR. W. H. WILKINSON has just been appointed representative in the passenger car equipment department of the Pressed Steel Car Company, which is planning to build steel passenger cars for street and steam railroad work. Mr. Wilkinson is well known in the street railway field, having been manager of the Peckham Manufacturing Company, at Kingston, N. Y., for some ten years. He severed his connection with the Peckham Company the first of the year. Mr. Wilkinson has also had a long experience with steam railroad work, having been for nine years in the Altoona shops of the Pennsylvania Railroad Company.

MR. HENRY CHASE PAGE, general manager of the Berkshire Street Railway Company, of Pittsfield, Mass., has been appointed to the position of superintendent of the Springfield Street Railway Company, of Springfield, Mass., which is controlled by the New York, New Haven & Hartford Railroad. Mr. Page is about 41 years of age. Twenty years ago he went to work for the Lynn & Boston Street Railway, as a conductor on the line from Chelsea to Boston. He was rapidly promoted, finally being placed in complete charge of the schedule arrangements and car despatching. When the Boston & Northern Company was formed, Mr. Page's ability was recognized by his appointment to the position of superintendent. On this road he had charge of 450 miles of track. Three years ago he took the position of general manager of the Berkshire Street Railway Company.

MR. C. A. GENUNG, who has for two years been the auditor of the Nashville Railway & Light Company, has received a highly deserved promotion and has accepted the position of general manager of the properties of the Chattanooga Electric Railway. Mr. Genung came to Nashville two years ago from Elmira, N. Y., as the auditor and chief accountant of the local company, and during his incumbency he has not only shown his business worth as proven by the new position which he will occupy, but has made friends with all with whom he has come in contact, and genuine regret is felt by his acquaintances and the employees of the company at the announcement that he will move from Nashville. Mr. Genung's place will be filled by Mr. H. Clyde Walters, who has lived in Nashville for about five years, going there from North Carolina. He has heretofore been the chief bookkeeper under Mr. Genung.

MR. FRANK C. RANDALL, whose appointment as New York representative of the Allis-Chalmers Company, of Milwaukee, was announced in the STREET RAILWAY JOURNAL recently, has entered upon the discharge of his new duties. Mr. Randall has for a long time been prominently identified with railway work, and resigned the position of vice-president and general manager of the National Electric Company. His first railroad experience was in 1877 with the New York & New England Railroad Company as "Performance of Engine" clerk. Later he was appointed chief clerk of the motive department of the same road, at Hartford, for all divisions west of Willimantic, and afterwards chief clerk of the motive power department of the Boston & Lowell Railroad and its leased lines. Upon the consolidation of the latter road with the Boston & Maine Railroad Company, he obtained a position in the shops of the Tripp Manufacturing Company, and was promoted to the position of superintendent of the plant. He resigned this position to become Eastern sales agent of the J. G. Brill Company, and later was made Western sales agent of this company, with headquarters at Chicago. After being in the employ of the J. G. Brill Company about six years, he was offered the position of Eastern sales agent of the Christensen Engineering Company, which he accepted, and later was appointed general sales agent and then vice-president and general manager of this company and its successor, the National Electric Company.

F. C. RANDALL

MR. W. W. DONALDSON, who has been electrical engineer of the Gould Storage Battery Company for the past four years, died at Elk Ridge, Md., on June 12. Mr. Donaldson was born June 16, 1863, at Baltimore, and entered Princeton at the age of eighteen. He remained at Princeton one year and a half, and left to take up special courses in chemistry and physics in Baltimore. He entered on storage battery work in February, 1884, and was connected in turn with the Storage Battery Company, of Baltimore, the Eastern Electric Company, and the Donaldson-Macree Storage Battery Company, of which he was president for three years, being a co-inventor with Mr. Macree of the type of battery manufactured by this company. In 1899 he became the engineer of the Automobile Manufacturing Company, of Baltimore, and in 1901 accepted the position of electrical engineer with the Gould Storage Battery Company, of New York, which he occupied at the time of his death.